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MOBILE APPLICATION FOR AUTISM SPECTRUM DISORDER CHILDREN

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ملخص

تمت كتابة هذه المذكرة لانشاء تطبيق هاتف ذكي يساعد الأطفال المصابين بالتوحد على التعبير عن مشاعرهم وفهم مشاعر الآخرين، لذلك اقترحنا فكرة إنشاء تطبيق ليكون بمثابة أداة لمساعدة المشرف على تعليم الطفل التوحد للتعبير عن مشاعره وهي معتمدة من المختصين ، ولأن الطفل المصاب بالتوحد لا يستطيع استخدام الهاتف أو الأجهزة الذكية ، فقد اعتمدنا على المشرف لمساعدته ، وقد اتبعنا الخطوات والنصائح التي فرضها المختصون لإنشائه.

لوصف مميزات وخصائص مشروعنا UML ثم استخدمنا لغة النمذجة الموحدة $Android\ studio$ كما شهدنا بعد ذلك مرحلة الإنجاز حيث استخدمنا برنامج اندرويد ستوديو. لضبط قاعدة البيانات مما جعل التطوير أسهل $Google\ firebase$ كما قمنا بالاستعانة بخدمات و ايضا لرسم تعابير الوجه والمشاهد $Adobe\ Illustrator$. واخيرا قمنا بعرض بعض واجهات التطبيق الخاص بنا.

كلمات مفتاحية

اندرويد، UML, Firebase, تطبيق محمول، Adobe Illustrator, تعبير عن المشاعر.

Abstract

The objective of this dissertation is to create a mobile application that helps autistic children express their feelings and understand the feelings of others. We decided to work on the point of expressing feelings, so we proposed the idea of creating an application to be a tool to help the supervisor educating the autistic child to express his feelings. And it is approved by the specialists, and because the autistic child cannot use the phone or the smart devices, we relied on the supervisor to help him. We have followed the steps and advice imposed by the specialists to create it.

We introduced first some theoretical concepts, about autism, as well as the contribution of technology in helping this group and then we used the UML modeling method to describe the main features and advantages of our project. Finally, we have reached the realization phase where we used integrated developing environments, which are android studio, and Google Firebase services for the database implementation, And also Adobe Illustrator to draw faces and scenes of expression these tools made the development easier, and we concluded the dissertation with screenshots of some interfaces from our application.

Key words

Android, UML, Firebase, Mobile application, Adobe Illustrator, Express feelings.

Acknowledgements

All praise belongs to ALLAH alone, and blessings and peace be upon the final Prophet. I am grateful to my loving family, Especially my parents for their encouragement, prayers, motivations, and being there. May God bless them. Many thanks to my supervisor Dr.GHRIBI HAYAT for her advices and support. CHENNI RAWYA

CHENNI RAWYA

Thanks to ALLAH in the first and last place and my parents who are among the greatest gifts of God, and they have all my respect, love, and appreciation. I would like to thank my supervisor Dr. GHRIBI HAYAT I had the honor and the privilege to work under her assistance and to benefit from her human qualities, professional skills and her great experience, she guided me throughout this work. Thanks to all of our families and our friends who have helped and supported us from near or far across our life...

Thanks to you all.

MERYEM ARIOUA

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General introduction

Autistic children are individuals who have been diagnosed with autism spectrum disorder (ASD), a neurodevelopmental condition that affects their social interaction, communication, and behavior. They have different communication difficulties such as Verbal Communication, Nonverbal Communication.

Communicating with others is one of the most difficult problems faced by autistic children as many of them suffer from speech impediments that vary in severity, a problem that many research centers around the world are working to overcome or find a cure for. The treatment of these children is much cost and needs more time, Technologie and software applications found for different solution to resolve the difficult challeges and enhance the life of people, therefore, is it possible for technology to help or contribute to the alleviation or treatment of autistic patients?

The hope has increased with autism patients when a technology company has come up with a new application that links the pronunciation of a word with its image. It includes 40,000 symbols with audio recordings to help autistic people form sentences. The program's applications included the production of games that help children communicate through colors and tactile objects

Since technology was an effective and contributing element to help alleviate the symptoms of this disease in children, as we noted above.

Create an application for children with autism to help them interact and express their feelings as well, as read and know the feelings of others to facilitate the communication of the autistic child with other children in his community, this kind of applications may also contributes and helps child parent or educator.

In this final dissertation, we present a mobile application to improve autistic children behavior, and help him to understand and express emotions. The dissertation presents different steps for the development of our solution. It's organized as follow In the first chapter, we introduced a comprehensive definition of autism, including the history of the disease, its causes and treatment, and its prevalence rate in Algeria with recommendations.

In the second chapter, we explain the possibilities given by technology to improve the expression of feelings of children with autism

In Chapter Three, we present different mobile applications for autistic children. And in the fourth chapter Analysis and Design of our application. And finally, the implementation step.

Chapter 1

Autism

1.1 Introduction:

Autism is one of the most mysterious and common developmental disorders in both fields of research and clinical studies, due to the lack of access to its real causes, as Autism was classified as a widespread developmental disorder that negatively affects several areas of development processes, and is characterized by the presence of abnormal or disordered growth, or both together. This disorder is found all over the world and in all ethnic and social classes. It is one of the most difficult developmental disabilities for a child and his parents and family. It is also a confusing and painful disorder for mothers who find it difficult to understand.

Disability of autism is that doctors, scientists, and specialists differed about its causes he classifies it as a psychological disease, and some of them suggest that it is an organic disease, but there is no dispute about it

A severe disability infiltrates children and causes deficiencies in linguistic, cognitive and social development sensory, and the child's lack of communication with the outside world surrounding him

1.2 Historical Overview Of Autism

The historical roots of the interest in autism are considered a controversial subject, as some scientific reports indicate that the interest in this category dates back to the scientific beginning of special education, specifically, the child that I am tard found in the French forests of Aveyron and later called him "Victor", as he was suffering from autism in addition to Severe

mental disability. The psychiatrist Bleuler presented the first description of autism when he talked about social withdrawal in schizophrenic people, likening it to what Freud described as auto-eroticism, withdrawal from reality, playing with parts of things, and emotional adjustment, which are among the main characteristics of autism.

In other reports, she indicated that the American doctor Leo Kanner was the first to refer to autism as a disorder that occurs in childhood, and that was in 1943 when he was examining a group of mentally retarded children at Hopkins University in the United States of America, and the researcher Kanner noted Unusual behavioral patterns of 11 children who were classified as mentally retarded, and among those behaviors that he noticed in those eleven children is their lack of awareness of the presence of people around them, and their failure to use verbal language in communication, and through this Kanner noticed that the behaviors of these children are one ten differ greatly from what is issued by their retarded peers, and therefore they represent a category other than mental retardation, and the disorder was then examined and diagnosed as a pattern of childhood schizophrenia[1].

1.3 What is Autism

Autism is a spectrum disorder that affects social interaction, communication, and behavior. It can appear in young children at a very early age and persist throughout life.

Autism can appear in different forms, some of which are mild and some that are severe, and it can be accompanied by imbalances in language, speech, movement, thinking, and mental perception.

Figure 1.1: What Is Autism

it is diagnosed based on a combination of different behaviors and symptoms, which include difficulty with social communication, unusual interests, impairment in the ability to think and understand socially, and an inability to interact normally. People with autism may be characterized as having certain skills in certain areas, such as mathematics. Or art or memory Definitions vary across directions. Here are some different definitions of autism:
knows (Abdel-Ghafer El-Damati 280, 1992) Autism is a disorder of comprehensive growth and development in the sense that it usually affects children in the first three years, and with the advent of language, on developmental processes in general. And lack of interest in others, and apathy of feelings, as they lack understandable words with a clear meaning. He is also characterized by introversion to himself. As for Hollin, 1995, he defines it as a term applied to one of the pervasive developmental disorders characterized by a lack or arrest of cognitive and language development. And so in growth is the ability to communicate, communicate, learn, and cognitive and social growth, and this is accompanied by an introverted withdrawal tendency, and self-closure with emotional and emotional stagnation, so that it becomes as if his nervous system suffers injury. He completely stopped working, as if his five senses had stopped communicating, receiving any external stimuli, or expressing his emotions and feelings. In response to any external change or pressure to get him out of his own world. Autism or autism spectrum disorder (ASD) is a neurodevelopmental disorder that affects communication, social interaction, and behavior. It is called a spectrum disorder because the symptoms and characteristics of autism can vary widely from person to person
There is no known cure for autism, but early diagnosis and intervention can help improve outcomes and quality of life for those affected. Treatment may include behavioral therapy, speech and language therapy, and medications for conditions such as anxiety or depression,

as well as occupational therapy. To ensure continuity of treatment, many sciences must be attended by autistic people or by their parents, which requires a lot of effort on the part of their parents or assistants [2].

1.4 Causes of Autism

There is no single clear and specific cause of autism, but experts believe that there are several factors that affect the emergence of this disorder these factors include:

1- Heredity: It is believed that there are genetic factors that lead to an increased risk of autism.

2- Exposure to harmful chemicals during pregnancy: such as exposure to mercury, lead, and other chemicals that affect neurological development.

3- Problems in neurological development: It is believed that some changes in the development and growth of the brain may lead to the emergence of autism.

4- Problems with the immune system: Some experts believe that autism may be linked to problems with the immune system.

5- Environmental factors: such as exposure to stress, changes in the environment, lifestyle and nutrition, which can affect neurological development and contribute to the emergence of autism.

It is not possible to be certain of any specific factor that causes autism, as autism can result from a group of factors that are intricately interrelate[3].

1.5 Symptoms of Autism

Each child with autism spectrum disorder usually has a distinctive pattern of behavior, and the severity level ranges from low to high functioning, and while some children with autism have difficulty learning, and some have scores below the usual intelligence, other children with They suffer from this disorder from normal to high, they learn quickly, but they have trouble communicating, applying what has been studied and assimilated in daily life, and adapting to

social situations, and the symptoms of autism can be summarized into two parts. Communication and social interaction

A person with autism spectrum disorder may have problems with social interaction and communication skills, including any of the following signs:

- The child does not respond when called by his name.
- refuses to be hugged and held, seems to prefer playing alone; Any withdraw into his own world.
- Not talking or being late in speaking, or the child may lose his previous ability to pronounce words and sentences.
- speaking in an abnormal tone or rhythm; He may use a monotonous voice or speak like a robot.
- Repeats literal words or phrases, but does not understand how to use them.
- - He does not express his emotions or feelings, as if he is unaware of the feelings of others.
- Doesn't point or bring objects to share his interests, as normal children do.
- Interacts socially inappropriately by being insensitive, hostile, or disruptive.
- Has difficulty recognizing nonverbal cues, such as interpreting other people's facial expressions, body position, or tone of voice.

Patterns of behavior

A child or adult with autism spectrum disorder may have problems with restricted and repetitive behavioral patterns, including any of the following signs:

- The child makes repetitive motions, such as rocking, spinning, or flapping hands.
- He may engage in activities that could cause him harm.
- He establishes certain procedures or rituals, and gets upset when there is the slightest change in them.
- Has coordination problems or has strange movement patterns, such as unsteady movements or walking on toes, and has strange, stiff, or exaggerated body language.

- He may be fascinated by the details of an object, but not grasp the overall picture or function of that object.

- He may be unusually sensitive to light, sound, and touch, yet be indifferent to pain or heat.

- Don't get distracted by imitation games or imaginative play.

- May be fascinated by an object or activity with abnormal enthusiasm or focus.

- He may have certain food preferences, such as eating only a few foods or refusing to eat foods with a certain texture.

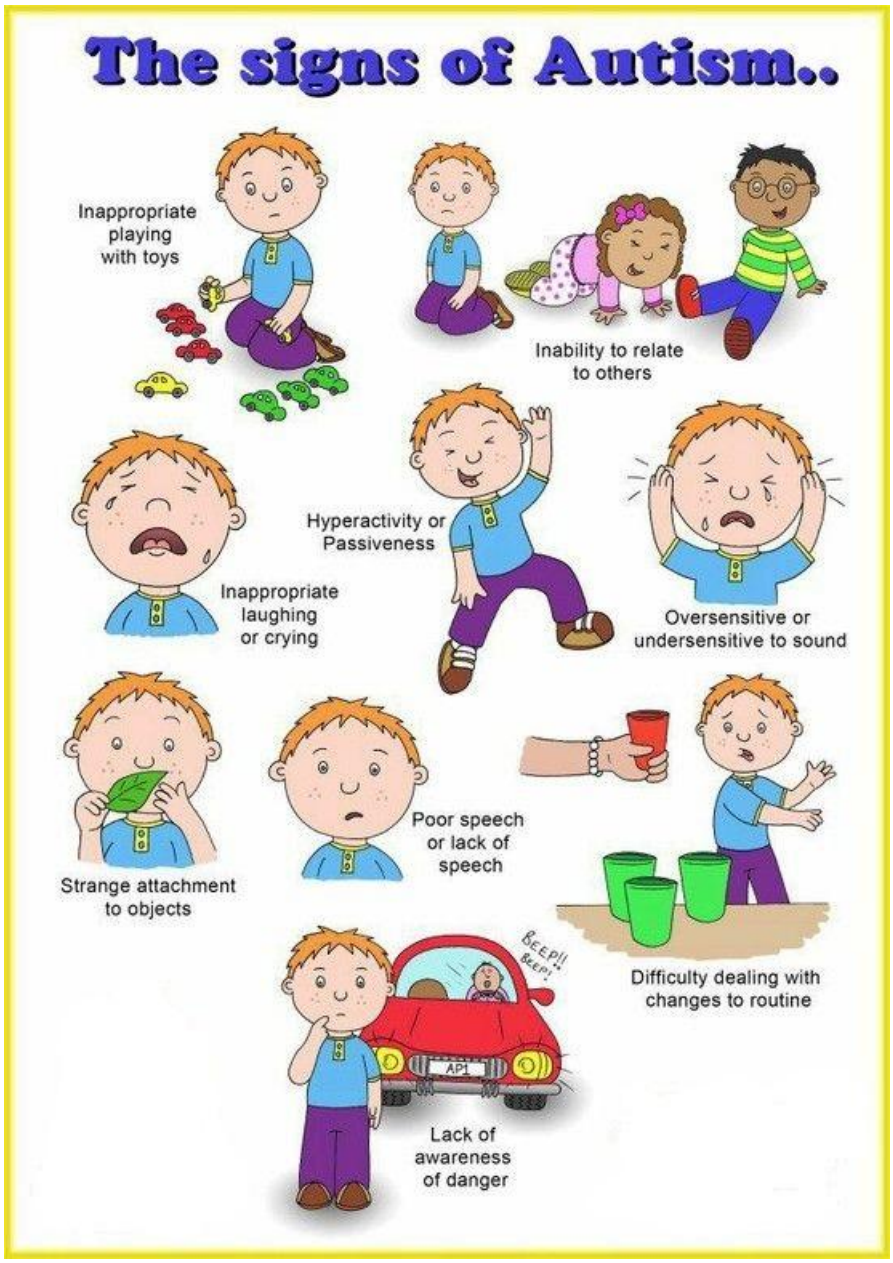

Figure 1.2: The Signs Of Autism

In fact, as a result of these behaviors, the autistic patient may suffer from many social, communication and behavioral problems, especially if the child is enrolled in a school in which he may suffer from bullying, social isolation, inability to deal independently, as well as major problems in academic achievement and interaction with his peers [4].

1.6 Types of Autism

Specialists use a reference called the American Diagnostic Manual IV - DSM4 issued by the American Psychologists Association, to reach a scientific diagnosis for autistic disorder. Hence we present some types of autism:

Asperger's disorder Asperger's Syndrome was first discovered by Hans ASPERGER.
Some call Asperger's syndrome high-functioning autism and Asperger's Syndrome More common than autistic disorder. It is similar to autism in terms of its prevalence Males are more than females [5].
Dr. PERGER HANS from the University of Vienna, Department of Pediatrics, has been diagnosed with autism
It includes several symptoms called Asperger's syndrome, namely: deficiency in balance skills, Depression, repetitive speech, voice output at the same pace, hatred of change in everything Whether in eating or clothing, they usually have certain rituals in their lives, which they play in Most of the time with one thing [6].
The criteria for diagnosing Asperger's syndrome are according to the Diagnostic and Statistical Manual

For mental disorders: A qualitative deficiency in social interaction.
Repeated stereotypical behaviors within a narrow range and a limited repertoire of interests.
The disorder causes significant clinical impairment in social and functional abilities Professional , and other functional fields. - There is no noticeable clinical language delay, for example, the use of the word at the age of two years and sentences
Communication is used at the age of three years.
There is no significant clinical language delay in cognitive or skill development Age-appropriate self-help or adapted behavior.
- The criteria do not apply to any other type of disorder such as schizophrenia or anyone Other developmental disorders[7].

Ret syndrome It is a female-only neurodevelopmental disorder identified by Andrea Rhett RIT ANDERAI, It appears during birth and becomes more in the second year of life, and notes It has only directed or purposeful hand movements and is replaced by monotonous, repetitive

movements that include loy

Hand, clap, and individuals with Rett syndrome develop profound multiple disabilities and require support throughout their lives and diagnose this syndrome through genetic scanning [8].

Psychiatry has been defined by the American Psychiatric Association in the Diagnostic Manual The fourth statistical diagnostic criteria for Rett disorder are as follows:

Visible normal growth before birth.

Clear and normal psychomotor development during the first five months after birth. Normal head circumference size after birth.

The onset of the following items appearing after going through normal stages of growth: Slowed head growth.

I lose the previously acquired ability to purposefully use my hands.

Loss of ability to social interaction acquired in the early stages.

Poor coordination between the movements of the legs and trunk.

Severe deficiency in the development of receptive language and expressive language accompanied by a severe delay in

Psychomotor development.

Childhood relapsing disorder This disorder is known as Heller syndrome, and it is a rare condition that can be diagnosed if:

Symptoms appeared after normal development and growth in the first two years of life, symptoms begin

before the age of ten characterized by regression in several areas

functional, and sufferers may lose bowel and bladder control, impairments in communication and patterns

Behavior Diagnostic criteria for childhood relapsing disorder according to the Diagnostic and Statistical Manual [9].

1.7 Prevalence rates of Autism

Autism spectrum disorders affect millions around the world, and according to United Nations figures, about 1% of the world's population suffers from autism, or about 70 million people. The figures reveal that males are 4 times more likely to develop autism than females, as autism

affects 1 in 37 male children and 1 in 151 female children around the world. As the reports of the Institute for Autism Research indicate, the disease has begun to spread greatly recently. It now affects (60) out of every 10,000 children in the age group (5-11 years), and this is a higher percentage than was previously known, which is 5 out of every 10,000 children. According to the statistics of the World Health Organization, the rate of people with autism around the world is increasing, as recent estimates indicate that the average global prevalence rate is (62) per 10,000 which means that one child out of every 160 children suffers from autism spectrum disorders. Most of the prevalence rates of autism spectrum disorder are found in developed countries, which have extensive databases and are high-income countries, where statistics are issued by bodies, councils and scientific research centers closely related to autism. The organization's statistics indicate that there are more than 3.5 million autistic people in the United States, while the US authorities estimate that 1 out of every 68 newborns in the country is born with this disease. It also indicates that in Algeria, which had a population of 45.02 million on July 1, 2021 (source: Population Directorate of the Ministry of Health) and one million births annually, there are more than 450,000 people with autism. . This issue is therefore of great concern to the authorities responsible for health and education. It also calls for improving the detection, diagnosis and care of people with autism, in line with international recommendations [10].

1.8 Autism and Human Rights

People with autism spectrum disorders have always suffered from stigma, discrimination, and lack of full access to health, psychological, and educational services in their communities, despite the affirmation of all human rights charters that "all persons, including those with autism, have the right to enjoy the highest possible level of mental and physical health."

Figure 1.3: Autism And Human Rights

In this sense, the Sixty-seventh World Health Assembly adopted in May 2014 a resolution titled "Comprehensive and Coordinated Efforts for the Treatment of Autism Spectrum Disorders" that was supported by 60 countries. The resolution urges the organization to cooperate with Member States and partner agencies in order to strengthen the national capacity to address

For autism spectrum disorders and other developmental disorders, efforts are focused on the following:

1- Increasing the commitment of governments to take steps to improve the quality of life of people with autism.

1- Providing guidance on developing policies and action plans that address autism within the broader framework of mental health and psychological disability.

1- Contribute to enhancing the capacities of caregivers and the health workforce to provide appropriate and effective care for people with autism.

1- Promoting inclusive and appropriate environments for people with autism. and other developmental disorders[11].

1.9 The Most Prominent Figures About Autism

1. 50% of people with autism suffer from intellectual disabilities.

2. The IQ of 44% of people with autism is above average.

3. 35% of them communicate non-verbally.
4. 18% of parents who have an autistic child have an increased chance of having a second child with autism.
5. 40% of autistic children between the ages of 6 and 15 experience discrimination and bullying.
6. 35% of people with autism between the ages of two and five are overweight .
7. 16% are obese.
8. 80% of autistic patients are unemployed [12].

1.10 Autism in Algeria

Even if the response to the challenges posed by autism is insufficient today in Algeria, much effort is being made to improve the situation. The challenges are great: autism is a major public health problem.

Autism is a disorder with far-reaching consequences for individuals, families, and society. In many cases - and in the absence of early care - its development can lead to disabilities of varying severity. Autism spectrum disorders are most often associated with intellectual disability in children ages 5 to 14

The World Health Organization estimates the prevalence of autism at 1% of the world's population. It is reported that in Algeria, which had a population of 45.02 million on July 1, 2021 (source: Population Directorate of the Ministry of Health) and one million births annually, there are more than 450,000 people with autism. This issue is therefore of great concern to the authorities responsible for health and education. It also calls for improving the detection, diagnosis and care of people with autism, in line with international recommendations[13].

1.11 Recommendations

Recent years have witnessed a significant increase in the number of people with autism spectrum disorder in the world, and this increase in numbers required more efforts that could be made to overcome the challenges facing people with autism and their families and empower them

effectively in society, and among the most important recommendations that can be implemented in this regard are: follows:
Develop policies and action plans that address autism within the broader framework of mental health and psychological disability.

- Increasing the number of governmental medical centers specialized in treating patients with autism, as the families of these patients suffer from the high cost of treatment in private sector centers.
  Raising government support for providing all health, educational and social services provided to children and their families with autism.

- Qualifying specialists in the treatment of autism and increasing their number, to accommodate the largest possible number of pediatric patients, and dealing with the crisis of qualified doctors and experts traveling abroad.
  Oblige specialized schools to accept autism patients from the most needy families free of charge. Spreading awareness about autism in all media and social media with the aim of accepting and assimilating people with this disease in society.

- Establishing specialized departments in the faculties of education and medicine to deal with and rehabilitate people with autism spectrum, and confirm their assignment after graduation in Egyptian government centers and hospitals for a period of no less than five years.

- Drama can contribute effectively to spreading successful models in work and life from people with autism, and thus a space of tolerance and assimilation can be created by members of society for these people.

Involvement of civil society institutions in supporting autism patients, in cooperation with the concerned state agencies, in order to provide more treatment centers and achieve community participation [14].

1.12 The Cure for Autism

Scientific research has proven that there is no cure for autism spectrum disorders, but psychological and social interventions such as behavioral treatment can reduce the difficulties of

communication and social behavior, and have a positive impact on the health and psychological state of the affected.

She also emphasized that the needs of the injured are complex and require a set of integrated services, including health promotion, care, rehabilitation services, and cooperation with other sectors such as the education, labor and social care sectors. Parents can play a key role in providing the necessary support for their child with autism, and they can help ensure the availability of health and educational services for the child, and they can provide caring and stimulating environments as they grow, and they can contribute to providing their child with psychological and behavioral therapy.

also technology has the potential to play an important role in supporting the needs of autistic individuals and improving their quality of life[15].

1.13 Conclusion

Autism is a complex neurological and developmental disorder that affects a person's ability to communicate, socialize, and interact with others. The exact causes of autism are not yet fully understood, but it is believed to be a combination of genetic and environmental factors.

Research suggests that early diagnosis and intervention can lead to better outcomes for individuals with autism, including improved communication skills, social interactions, and overall quality of life.

It is important to recognize that individuals with autism are unique individuals with their own strengths and challenges, and it is essential to provide them with appropriate support and resources to help them reach their full potential.

While there is no cure for autism, ongoing research and advancements in treatment and therapy can help individuals with autism live fulfilling and productive lives. It is crucial to raise awareness and promote acceptance and inclusion for individuals with autism in society.

Chapter 2

Technology and Emotions Expression for Autistic children

2.1 Introduction

Autism is a developmental disorder that affects communication and social interaction skills. One of the common challenges for autistic children is the difficulty in expressing and understanding emotions. The inability to express emotions can lead to frustration and isolation, which in turn may affect their overall mental health and well-being.

Technology has emerged as a promising tool to assist autistic children in learning and practicing emotional expression skills.

Overall, technology has shown great potential in assisting autistic children in developing emotional expression and recognition skills, which can improve their overall social interactions and quality of life.

2.2 Emotion Expression

Emotions expression refers to the ability to convey one's emotions through verbal and non-verbal communication, such as facial expressions, body language, tone of voice, and gestures. It is an essential aspect of human interaction and plays a significant role in establishing and maintaining social relationships.

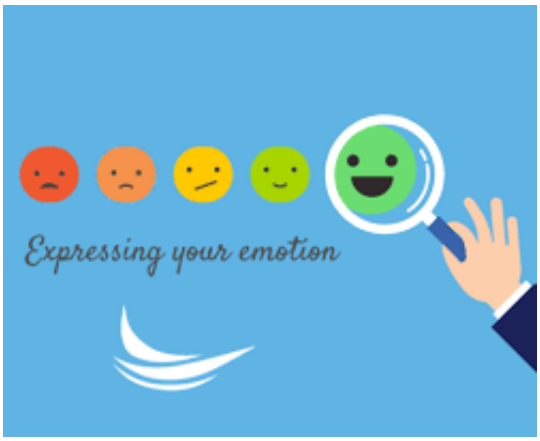

Figure 2.1: Emotions Expression

Effective emotions expression involves recognizing and identifying one's own emotions and being able to communicate them appropriately to others. It also involves understanding the emotions of others and responding appropriately to them.
There are various techniques and strategies that can be used to improve emotions expression skills, such as social skills training, cognitive-behavioral therapy, and mindfulness techniques. Overall, emotions expression is a crucial aspect of social interaction and plays a significant role in establishing and maintaining relationships[16].
Emotions are a natural part of being human and expressing them in a healthy way is important for our mental and emotional wellbeing. Here are some tips for expressing emotions in a normal and healthy way:

- Identify the emotion: The first step in expressing emotions is to identify what you are feeling. Are you happy, sad, angry, frustrated, or anxious? Recognizing your emotions can help you express them in a more effective way [17].

- Find a safe space: It is important to find a safe space to express your emotions. This could be a quiet room in your home, a park, or a place where you feel comfortable and secure [18].

- Talk to someone: Talking to someone you trust, such as a friend or family member, can be helpful in expressing your emotions. They can provide support, guidance, and a listening ear [19].

- Use "I" statements: When expressing your emotions, it is important to use "I" statements

instead of blaming or accusing language. For example, instead of saying "you always make me angry," try saying "I feel frustrated when this happens" [20].

- Practice self-care: Taking care of yourself is important when expressing emotions. This could include activities such as exercise, meditation, or spending time in nature [21].

- it is okay to feel emotions, and expressing them in a healthy way can help improve our overall wellbeing.

2.3 Emotions Expression and Autistic Children

A new study suggests an explanation for the difficulty of social communication in children with autism due to their inability to correctly interpret facial expressions. According to what the researchers suggest: the child with autism misinterprets the expression of the face of the one he talks to, and believes that the expression of surprise is a feeling of fear, and confuses the expression of disgust with the expression of anger.
A child with autism needs to learn a lot about social situations to gain experience in realizing the feelings around him
Autism is a major health problem that affects a child's ability to communicate and social interaction. According to a study conducted at the University of Bristol in Britain, children with autism find it difficult to interpret intense emotions despite their ease, and the degree of difficulty in interpreting them is equal to the difficulty of interpreting low-intensity emotions. According to the experiments of the study published by the "Autism" magazine, two groups of children were presented with verbal and visual situations that reflect different feelings, such as surprise, disgust, sadness, joy, fear, and anger. The group of children with autism could not accurately distinguish the nature of feelings.
This means that the child with autism needs to learn a lot about social situations in order to gain experience in recognizing the reality of the feelings surrounding him, and communicating with them[22].

2.4 Emotions Expression Difficulties For Autistic Children

Autistic children may experience challenges in expressing their emotions in ways that are easily understood by others. Some possible reasons for this difficulty include:

1- Differences in social communication skills: Autistic children may have difficulty with nonverbal communication, such as facial expressions, tone of voice, and body language. They may also struggle to understand the social context in which emotions are expressed, making it hard for them to pick up on social cues.

2- Sensory processing differences: Autistic children may have heightened sensitivity to sensory stimuli, which can be overwhelming and distracting. This can make it difficult for them to regulate their emotions and express them appropriately.

3- Difficulty identifying and labeling emotions: Autistic children may have difficulty recognizing and naming their own emotions, which can make it hard for them to communicate how they are feeling to others.

4- Executive functioning challenges: Autistic children may struggle with executive functioning skills, such as planning, organization, and problem-solving. This can make it difficult for them to regulate their emotions in a way that is socially appropriate.

Figure 2.2: Emotions Expression Difficulties For Autistic Children

To support autistic children in expressing their emotions, it is important to provide them with a safe and supportive environment where they feel comfortable expressing themselves. This can include using visual supports, such as picture cards or social stories, to help them identify and label their emotions. It can also involve teaching them coping strategies, such as deep breathing or taking a break, to help regulate their emotions when they become overwhelmed. Additionally, it is important to work on building their social communication skills and helping them understand the social context in which emotions are expressed [23].

2.5 Our experience in the field lurking

(The study was conducted from February 26, 2023 to March 27, 2023)
In order to get closer to children with autism, understand them, and learn how to do our application.

We were in the" HOSPITAL INSTITUTION FOR MENTAL ILLNESSES" (Awlad Mansour) in Al-Nahar Centre. Our experience with autistic children was a special one. It was a research study that we called Young and Beautiful Minds.

During our experiment, we supervised a group of children with autism. I called it common features. We were able to understand the types of autistic children, how specialists deal with them, and the educational methods available there.

As for the children that we found there, he either has poor social communication, or eye contact pressure, repetitive and uncontrolled behaviors, as well as special behaviors that are unique to each person, in addition to that some of them do not speak. We used to take children and apply the learning system and its effect on behavior on them, and we were we go to training sessions with them. Where we dealt with the child in a special way and trained.

We were able to capture these characteristics through follow-up training, where these children have a fear of the surroundings, society and gatherings, and their voices are very loud, they only hear their own voices, and no one can approach them.

Where we watch them running around a lot, they are always touching something that is special to them, if it is a toy or string or something that always goes with them.

They are afraid and terrified, but they are looking for the security that someone can give them, Through hugs, but the autistic child is not allowed to hug anyone, so they hugged themselves When understanding the psychological and neurological condition of children with autism and the special behaviors in order to be able to balance with their inner world, then the person can learn how to deal with them.

We noticed that they do not perceive the information quickly, because they do not receive it like normal children, so they superimpose the information on top of each other.

When we watch children with autism, we notice that they have a pattern of their own. If you accept this pattern and train yourself how to deal with it, you will begin to realize that they have their own eating, eating, behavioral, and social pattern.

Thus, it will be easier to teach them and your acceptance of them will be easier. Since it is not easy to give an autistic child his trust in you and others, but he can give something gradually because he puts a barrier between him and you.

We met with a group of doctors and specialists in the field, some of whom rejected the idea, and some of them encouraged it and gave some advice that the application should be supervised by specialists in this disease.

“ Greetings to every family and every mother who has an autistic child. And all the teachers. And the supervisors who deal with this disease because they dealt frankly with patience, love, and acceptance for this group, because they taught us that this life gives us new patterns of humanity ” .

2.6 Is it possible for technology to help or contribute to the alleviation or treatment of autistic patients

Technology can certainly help in the alleviation and treatment of autistic patients. Here are some examples:

1. Augmentative and alternative communication (AAC) devices: Some autistic individuals have difficulty with verbal communication, and AAC devices can assist them in expressing themselves. These devices can range from simple picture cards to high-tech speech-generating devices that use synthesized speech.

Figure 2.3: Example of AAC devices

2. Virtual reality (VR) therapy: VR technology can be used to simulate social situations in a controlled environment, which can help autistic individuals practice social skills and learn how to respond appropriately to social cues.

Figure 2.4: Virtual Reality

3. Behavioral tracking and data analysis: Technology can be used to track and analyze the behavior of autistic individuals, which can help clinicians and caregivers better understand their needs and develop effective interventions.

4. Telemedicine: Telemedicine allows for remote access to healthcare services, which can be especially beneficial for individuals who live in remote areas or have difficulty traveling to appointments. This can include remote consultations with clinicians, remote monitoring of medication adherence, and remote counseling sessions.

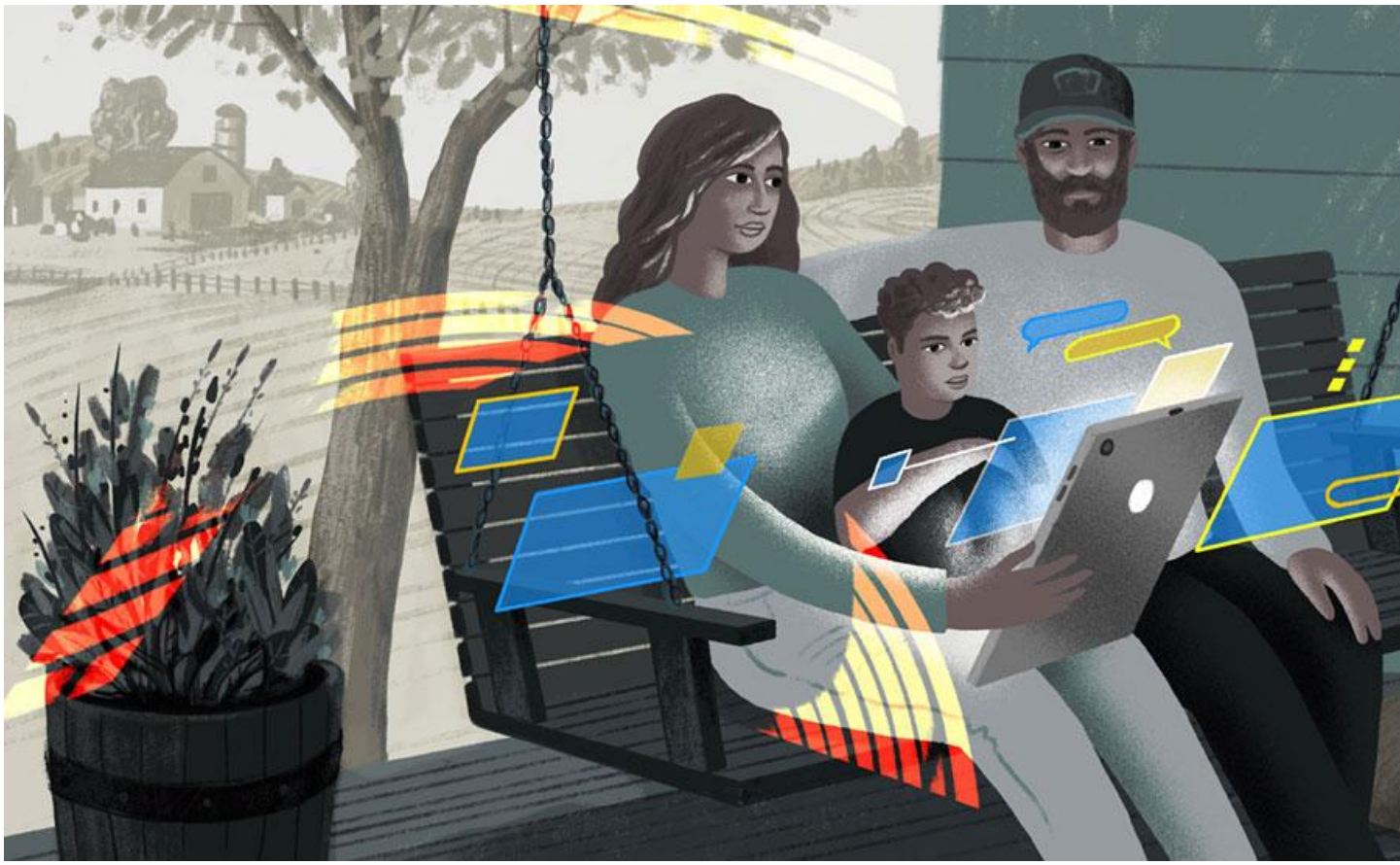

Figure 2.5: Telemedicine

Overall, technology has the potential to play an important role in supporting the needs of autistic individuals and improving their quality of life. However, it is important to approach the use of technology in autism treatment with caution and to ensure that it is used in a way that is evidence-based and tailored to the individual's needs

There are many apps available for individuals with autism that can help improve communication, social skills, so what is mobile application and what are there turn in alleviating symptoms of autism in children [24].

2.7 Conclusion

Based on available research and anecdotal evidence, it appears that technology can be a valuable tool for assisting autistic children with expressing and recognizing emotions.

Some technologies, such as emotion recognition software and virtual reality programs, can help autistic children practice identifying and expressing emotions in a safe and controlled

environment. Other technologies, such as wearable devices and mobile apps, can provide real-time feedback and support to help children regulate their emotions and communicate effectively. However, it is important to note that technology should not be seen as a substitute for human interaction and support. Autistic children still need the guidance and support of caring adults to help them navigate social situations and learn to manage their emotions.

In conclusion, while technology can be a useful tool in supporting emotional expression for autistic children, it should be used in conjunction with other forms of support and guidance to ensure the best outcomes for these individuals.

Chapter 3

Mobile application for autistic children

3.1 Introduction

Today's applications help a child with autism to identify the surrounding things and stimulate the process of speaking to them through a lot of exercises and entertaining exercises that are very suitable for children

Research has shown that mobile apps can be effective tools for promoting emotional expression and regulation in autistic children. A study published in the Journal of Autism and Developmental Disorders found that using a tablet app with visual supports and choice-making features helped children with autism spectrum disorder (ASD) communicate their emotions more effectively.

Another study published in the Journal of Child Psychology and Psychiatry found that a computer-based program that used animated characters to teach emotion recognition and regulation skills was effective in improving emotional understanding in children with ASD.

and through today's topic we will review with you a group of autism children's education applications that help the autistic child interact and learn about things through entertaining and entertaining means to start entering into social relationships and getting acquainted On things simply

3.2 Mobile Application

What is a Mobile Application? A mobile application is a software application developed specifically for use on small, wireless computing devices, such as smartphones and tablets,

rather than desktop or laptop computers Mobile apps are sometimes categorized according to whether they are web-based or native apps, which are created specifically for a given platform. A third category, hybrid apps, combines elements of both native and web apps.
in today's digital age, mobile apps are an essential part of most people's daily lives. From social networking and entertainment to productivity and business, mobile apps play a vital role in how we interact with technology[25].

Figure 3.1: represent what can a mobile app do for a business

How Are Mobile Apps Built Mobile apps are built using a variety of programming languages and frameworks, and they can be downloaded and installed from app stores such as the Apple App Store or Google Play
Mobile apps are designed to provide a wide range of functions and services and with consideration for the demands, constraints and capabilities of the devices they're built for. For example, a gaming app might take advantage of the iPhone's accelerometer .
Other examples include games, social media platforms, email clients and banking apps. They can also be used to access information, such as news and weather updates, and to perform tasks, such as online shopping and booking travel [26] .

Figure 3.2: represent the mobile app development process

How Does Mobile App Work Mobile apps are designed to run on specific mobile operating systems such as iOS , Android and Windows Phone. When a mobile app is downloaded and installed on a device, it is stored in the device's memory and is launched using the device's operating system.

When a user opens a mobile app, the app communicates with the device's operating system and other built-in software components to access

the device's hardware and services such as the camera, GPS and internet connection. The app then uses this information to provide its specific functions and services to the user[27].

3.3 Mobile Operating Systems

The operating system is the guarantor of the functions and features available on your mobile device, such as the wheel, the keyboard, WAP, synchronization with mobile applications, email, SMS... The operating system mobile will also choose which third-party apps can run on your device. Choosing your device according to its operating system can be a very important criterion[27].
There are many types of operating systems, such as:

IOS Apple Operating System Apple iOS is a proprietary mobile operating system that runs on mobile devices such as the iPhone and iPad.
Apple iOS stands for iPhone operating system and is designed for use with Apple's multitouch devices. The mobile OS supports input through direct manipulation and responds to various user gestures, such as pinching, tapping and swiping. The iOS developer kit provides tools that allow for iOS app development [27].
Also:

Android mobile operating system **What Is Android** -Android is a mobile operating system based on a modified version of the Linux kernel and other open-source software, designed primarily for touchscreen mobile devices such as smartphones and tablets. Android is developed by a partnership of developers known as the Open Handset Alliance and commercially sponsored by Google. It was disclosed in November 2007, with the first commercial Android device, the HTC Dream, launched in September 2008. It is free and open-source software. Its source code is Android Open Source Project (AOSP), primarily licensed under the Apache License. However, most Android devices dispatch with additional proprietary software pre-installed, mainly Google Mobile Services (GMS), including core apps such as Google Chrome, the digital distribution platform Google Play and the associated Google Play Services development platform.

1. About 70% of Android Smartphone runs Google's ecosystem, some with vendor-customized user interface and some with software suite, such as TouchWizand later One UI by Samsung, and HTC Sense.

2. Competing Android ecosystems and forksinclude Fire OS (developed by Amazon) or LineageOS. However, the "Android" name and logo are trademarks of Google which impose standards to restrict "uncertified" devices outside their ecosystem to use android branding [28].

Architecture Of Android OS The android architecture contains a different number of components to support any android device needs. Android software contains an open-source Linux Kernel with many C/C++ libraries exposed through application framework services. Among all the components, Linux Kernel provides the main operating system functions to Smartphone and Dalvik Virtual Machine (DVM) to provide a platform for running an android application. An android operating system is a stack of software components roughly divided into five sections and four main layers, as shown in the below architecture diagram [29].

1. Applications.

2. Application Framework.

3. Android Runtime.

4. Platform Libraries.

5. Linux Kernel.

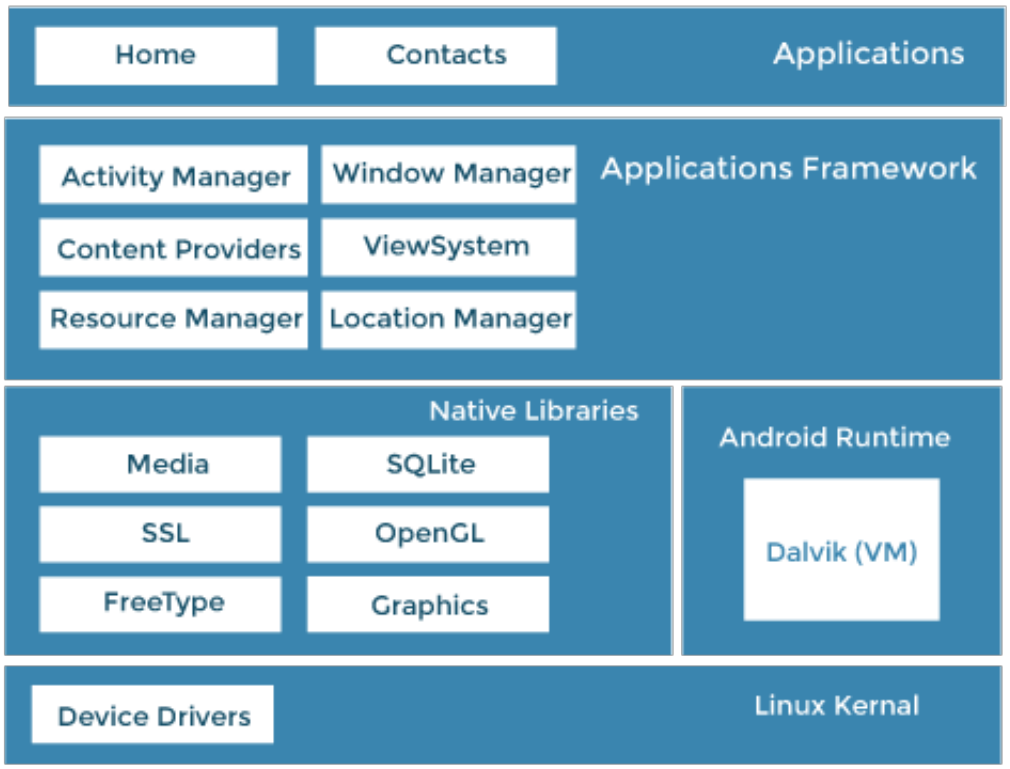

Figure 3.3: Architecture of Android operating system

Advantages Of Mobile Apps There are numerous advantages to using mobile apps, namely:

1. Convenience: Mobile apps can be downloaded and installed on a device, allowing users to access the app's functions and services at any time, from anywhere.

2. Personalization: Mobile apps can be customized to meet the specific needs of individual users, providing a personalized experience.

3. Offline access: Many mobile apps can be used offline, providing access to important information and features even when an internet connection is not available.

4. Push notifications: Mobile apps can send push notifications to users, providing real-time updates on important information and events.

Disadvantages Of Mobile Apps However, there are some disadvantages and considerations to keep in mind when using mobile apps. These include:

1. Limited functionality: Mobile apps are designed to provide specific functions and services, and they might not be able to provide the same level of functionality as a desktop application.

2. Limited compatibility: Mobile apps are designed to run on specific mobile operating systems, and they might not be compatible with all devices.

3. Security concerns: Mobile apps can access sensitive information on a device, and they might not have the same level of security as a desktop application.

4. Limited updating capability: Some mobile apps might not be easily updated, and users might need to download a new version of the app to access the latest features and bug fixes.

While mobile apps offer convenience, personalization and offline access, they also have limitations in terms of functionality, compatibility, security and updating capability. Business software buyers should consider the advantages and disadvantages of mobile apps when deciding on a distribution method for their software.
As the mobile market continues to grow, mobile apps are becoming an increasingly popular way for businesses to engage with customers and employees, providing a convenient, personalized and secure way to access important information and perform tasks on the go [30].

3.4 How does mobile Applications for emotions expression help autistic children?

Apps can be helpful in facilitating the expression of feelings for autistic children in several ways:

1. Visual Representation: Many autistic children have difficulty expressing their emotions verbally. Apps can provide visual representations of emotions through images, symbols, or avatars. By selecting or pointing to these representations, children can communicate their feelings more easily and accurately.

Figure 3.4: Visual Representation

2. Social Stories: Some apps offer social stories that explain different emotions and situations. These stories use visual supports, text, and audio to help children understand and identify various feelings. By engaging with these stories, children can learn to recognize and express their own emotions.

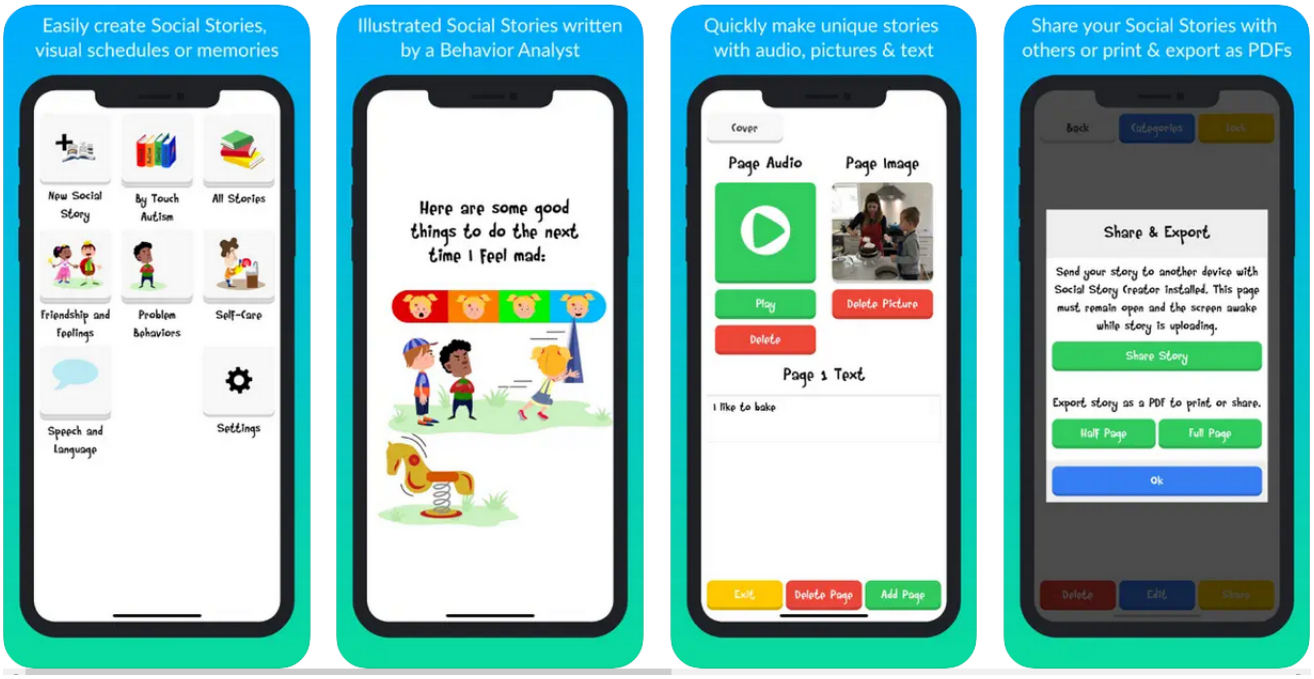

Figure 3.5: Social Stories application

3. Animated Characters: Apps often use animated characters or interactive elements to depict emotions. These characters may display facial:

1. Expressions, body language, or voice changes that represent different feelings. Autistic children can observe and interact with these characters to learn about emotions and practice expressing them.

2. Choice-Making: Apps with choice-making features allow autistic children to select their emotions from a range of options. This approach empowers them to communicate their current emotional state, promoting self-awareness and self-expression. It also encourages emotional vocabulary development.

3. Communication Support: Some apps provide a communication platform where children can share their feelings with others, such as parents, teachers, or therapists. These apps may offer text-based messaging, visual representations of emotions, or the ability to record and share voice messages. Such communication support can enhance connection and understanding between the child and their caregivers.

4. Self-Reflection and Regulation: Certain apps include interactive activities or games that prompt children to reflect on their emotions. These activities may involve identifying and labeling emotions, exploring triggers, or practicing calming strategies. By engaging in these activities, autistic children can develop emotional regulation skills and increase their self-awareness.

It's important to note that the effectiveness of apps in expressing feelings may vary for each individual child. Some children may benefit more from apps that focus on visual representation, while others may respond better to interactive games or social stories. Additionally, parental or caregiver involvement is crucial in using apps to support emotional expression, as they can provide guidance, reinforcement, and validation of the child's emotions.

3.5 Deferent Autism Applications

1-Look At Me -application is a product of cooperation between Samsung, Seoul University, and the Department of Psychological Sciences at Yonsei University in Korea. This application aims to raise awareness of children with autism by increasing their interaction and their ability to communicate with eyes, which is the biggest social challenge facing these children. Through the application, he can play. Through a set of challenges and tests specially designed to develop the ability to see the eyes of other people. And improve their social skills, there are six tasks

in this application, and each of them needs to practice a certain type of good expression. In addition to other tasks that encourage drawing an expression on the faces themselves, and it is possible to win Points depending on the user's performance. It is recommended to use this application from 15 to 30 minutes on a daily basis. And it was tested on 20 children for eight weeks. It is currently available on the Google Play Store and the App Store.

Figure 3.6: look at me app logo

2- Family Locator by Life360 Family Locator by Life360 is a great app for tracking kids, friends, and this app puts caregivers connected to kids and teens with autism Life360 works on a mobile device and allows family members to be seen on a map,

Figure 3.7: Family Locator app logo

communicate with them, and receive alerts when they leave and arrive home, school, or work.

3-Endless Reader Reading is one of the most complex tasks for children with autism, and the Endless Reader app blends many visual and auditory tendencies. This tool combines words and pictures so that children can begin to understand the basic steps of reading.

Figure 3.8: endless reader app logo

4-Autism iHelp Is helpful for nonverbal autism, designed to integrate auditory and visual stimuli. It helps autistic kids to connect images with their accompanying sounds, helping them to

Figure 3.9: Autism iHelp app logo

understand the world around them [31].

3.6 Conclusion

The existing autism applications offer a wide range of tools and support for individuals with autism spectrum disorder (ASD) and their families. While some applications show promise in enhancing communication, education, and behavioral management.

Chapter 4

Analysis And Design

4.1 Introduction

In order to help autistic children, their parents or educators, we propose the development of an educative mobile application. It will help children with autism to increase their adaptive, cognitive, and social skills. This model allows children to learn parts of the face as well as facial expressions and scenes, to learn, understand and be able to express their feelings.
In this chapter, we will first present a general architecture of our system that contains describe the various interactions between the actors and other components of the system. Then, for the design, we use the UML language which makes it possible to represent graphical concepts and model applications , we used StarUML to generate various UML diagrams.

4.2 Problem

according to our study about autistic children, technology may pose a threat to children with autism, if it will not be controlled, The IHM of the application and interaction functionality must be carefully designed, and therefore the presence of a supervisor or a parent must be taken into account when the child uses the application to avoid this harm, as he monitors him when he learns the lessons in the application and makes sure that he learns each element and repetition if necessary, also the problem of design Considering that children with autism are a special and distinct category, and therefore the design of application interfaces is special, so IHM rules must be taken into account to suit this category.

4.3 The objective of our application

The aim of our application is to provide an easy-to-use and accessible tool that support autistic children them in understanding, recognizing and expressing emotions effectively. Here are some of the specific goals of this mobile application:

1. **Visual cues for emotion recognition:** The application aims to provide visual cues, such as facial expressions or pictorial representations, that help autistic individuals to recognize and understand different emotions. These visual cues can support their understanding of emotions and facilitate their ability to accurately identify and label them.

2. **Interactive activities to explore emotions:** A mobile application can offer interactive activities, games or exercises that engage individuals with autism in exploring and experiencing different emotions. These activities may include matching feelings to corresponding visual cues, engaging in scenarios that evoke specific feelings, or participating in interactive stories that focus on emotional content. The goal is to provide an engaging, hands-on experience that fosters emotional exploration.

3. **Personalized Emotional Tools:** The app can provide individuals with autism with customized tools to express their feelings in a way that suits their preferences and abilities. This may include customizable visual avatars, emoticons, or symbols that represent different emotions, allowing individuals to choose and share the emotions they are experiencing.

4.4 General Description of our mobile application

We have created a software application designed to run on mobile devices, where the user creates an account, and his personal information (name, surname, date of birth, gender, password) is save. The main page is call (emoticons) consisting of a levels interface where the levels are organized and closed. Only the first level is available, as the next level is open upon success in the previous level.

Each level consists of stages: an education stage and an exam stage, where they learn and understand in order to be able to express their feelings, interact and enhance their competence, enhancing physical and mental well-being. The levels consist of symbolic images, sounds and scenarios.

This application saves the user's status when registering a second time, in order to know the percentage of his understanding and success.
The functions and design of the application may vary depending on the supervisors and specialists in the field of this disease (autism spectrum), but the goal is to provide an easy experience that helps reduce the effort of parents and teachers, and also in order to integrate this group into society through the ability to express their feelings.

4.5 The UML modeling process

Definition of UML UML (Unified Modeling Language), is defined as a graphic modeling language and textual intended to understand and define needs, specify and document systems, sketch software architectures, design solutions and communicate business insights seen.
UML models all the data and processing by developing different diagrams. Clearly, UML should not be designed as a method but rather as a toolbox used to improve working methods [32].

The different types of diagrams UML in version 5.1.0 revolves around thirteen diagrams, each of them is dedicated to the representation of a software system from a particular point of view. These diagrams are grouped into two main sets : structural diagrams and behavior diagrams [33].

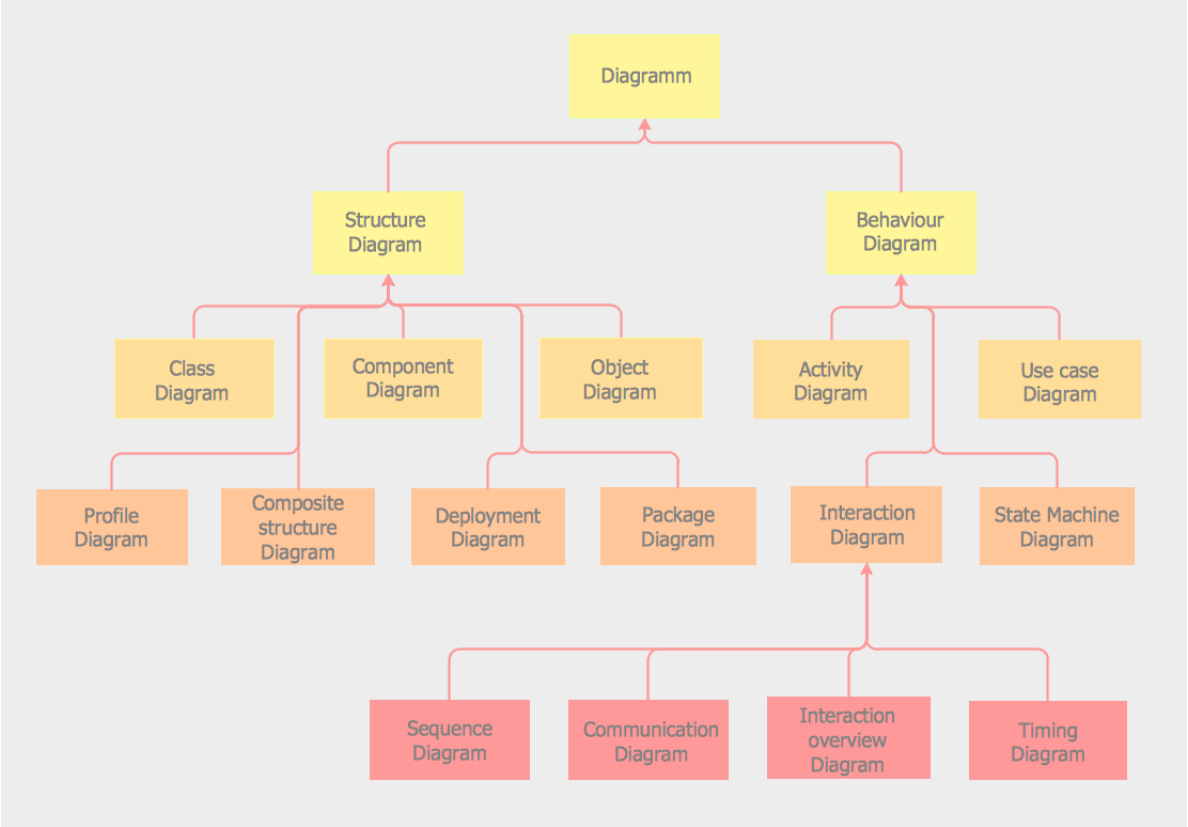

Figure 4.1: The hierarchy of UML 5.1.0 diagrams as a diagram.

These diagrams, of varying usefulness depending on the case, are not necessarily all produced opportunities for modelling . The most useful for project management are:

1. Use case diagram
2. Sequence diagram
3. Class diagram

4.6 Modeling of our application using UML language

Specification of needs Defining requirements is the first stage of the application development cycle.

It must describe the application to be developed unambiguously.

It represents all the services that the software has to provide to its user.

According to the unified process, each service is designed according to the use case and finally develops a UML diagram of the use case. Each use case is described in text form that represents

a symbolic scenario (a set of actions to be performed to achieve the goal).

In this step, we will define all functional and non-functional needs related to our application.

Next, we will model the semi-official specification

Needs to use use case diagrams and sequence diagrams.

Functional needs :

These are the functionalities that the system must provide to the various actors. These are requirements specifying the input/output behavior of the System. The system must allow: To the supervisor:

1. Accounts' management: -log in, log out, -delete,-add. To the child
2. do the lesson
3. do the exams

Non-functional needs :

These are the needs that characterize the system. These are performance requirements, type of material, or type of design. These needs may relate to implementation constraints (programming language, DBMS type, operating system, etc.) as part of this work, the application must be extensible, means there may be an opportunity to add or modify new features. The application should be able to:

1. Save the information of the accounts.
2. Save the level of each child.
3. It should also be noted that the application must be extremely secured to preserve users information.

4.7 Analyze of needs

Use case Diagram by system users. This is the first diagram of the UML model, the one where ensures the relationship between the user and the objects that the system implements Actors

There are two types of actors who can use our application, the supervisor and the kid:

1. The Supervisor: He is a member who creates an account for the kid on our application.
2. The kid: He is a user who learns and passes the exam at every level.

Use cases

A use case represents a set of action sequences that are performed by the system and that produce an observable result of interest to a particular actor. It allows describing what the future system will have to do, without specifying how it will do it

You must do more explication for

The Supervisor:

The supervisor can do the following actions: (-Register –Modification –Delete –Add –login -Start level)

The kid: The kid can do the following actions:

1. learning.
2. examine

The following figure shows the use case diagram of our application.

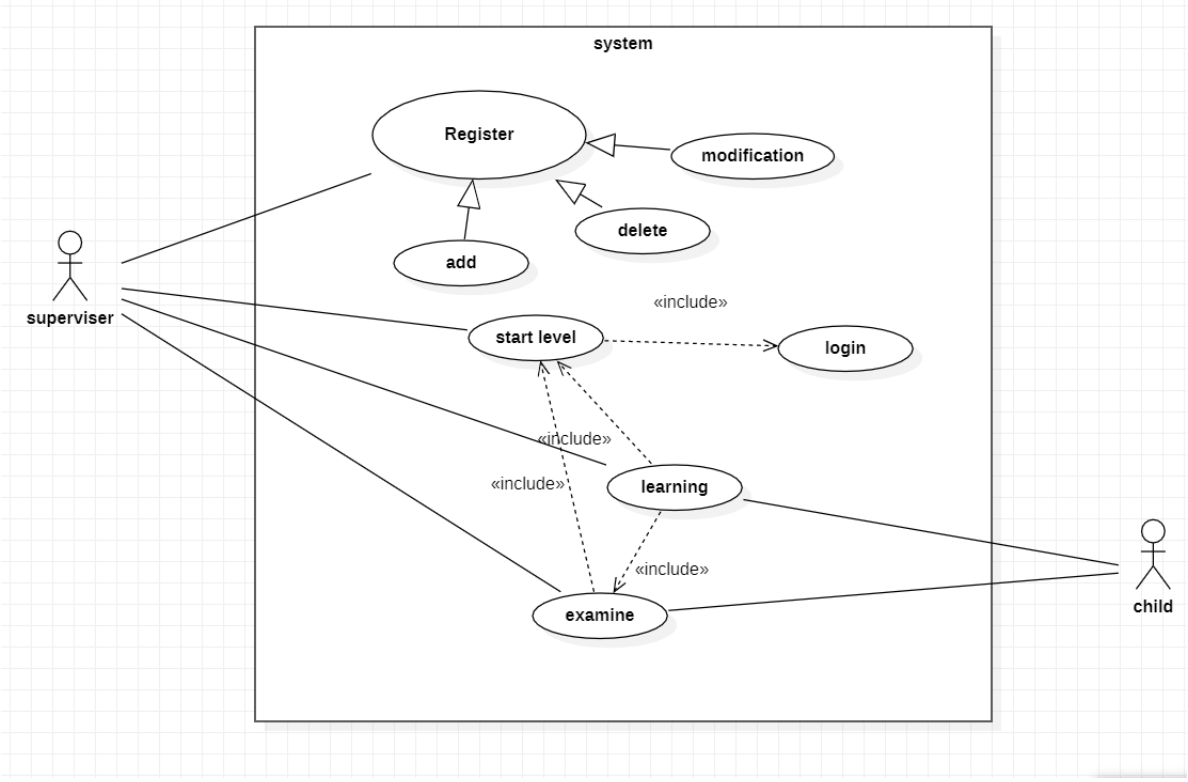

Figure 4.2: Use case diagram

Specification Of Requirements -We will describe in detail some use cases identified in the previous diagram.

Use Case	Create Account
Actor	The supervisor
Description	The supervisor creates an account in the application
Pre-condition	The mobile device must connect to the internet
Nominal scenario	fill in the different fields, then validate
Post-condition	Account created successfully
Exception Scenario	registration failed, error message should be displayed at the supervisor

Use Case create account

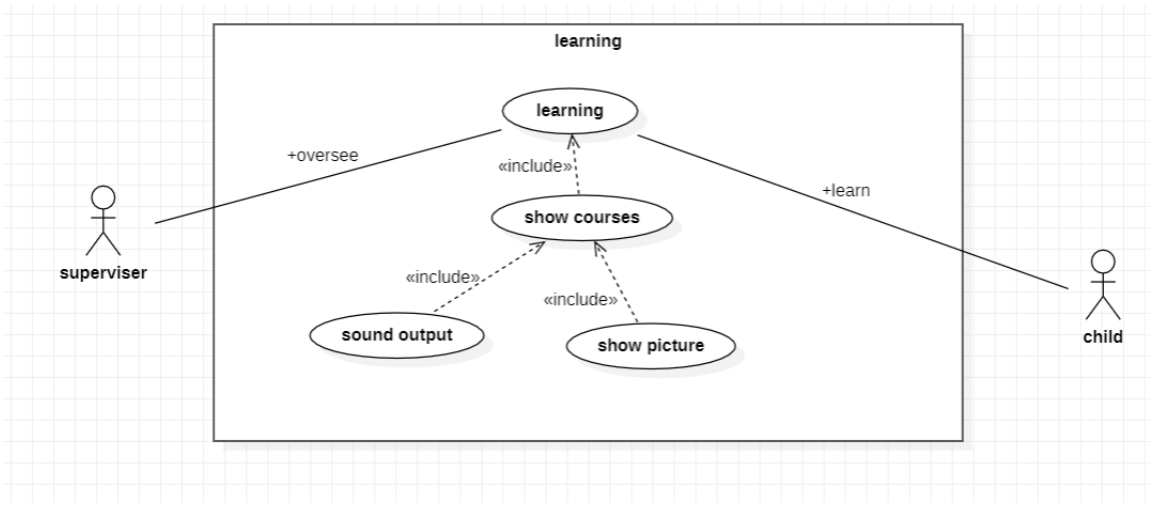

Figure 4.3: Use case diagram of learning

A.Learning use case

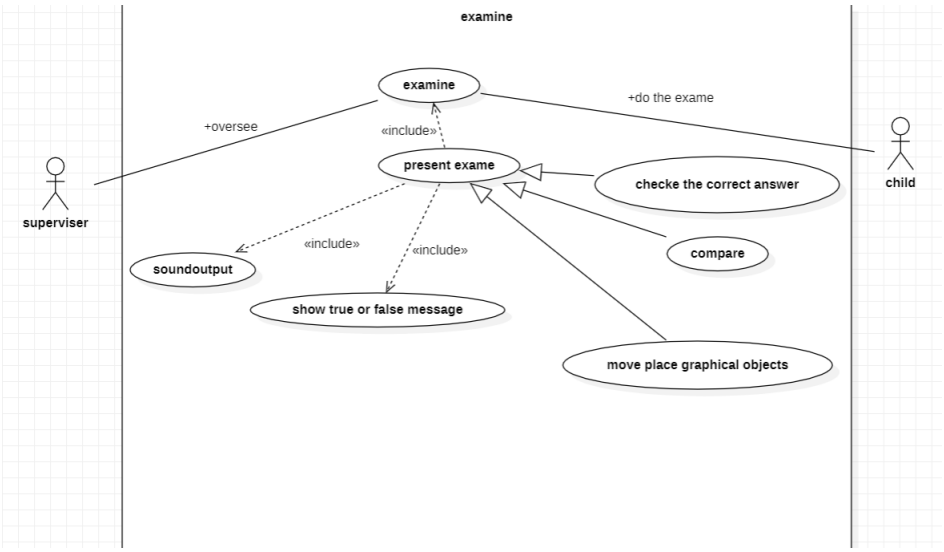

Figure 4.4: Use case diagram of examine

B. Examine use case

Sequence diagram: represents the chronological succession of Operations performed by an actor. It indicates the objects that the actor will manipulate and the operations that make move from one object to another.

The same operations can be represented by a diagram of communication,

a graph whose nodes are objects, and arcs (numbered according to the chronology) of the exchanges between objects. Sequence diagram and sequence diagram communication are two different views, but logically equivalent (we can build one from the other) of the same chronology.

Create Account This diagram describes the Register use case scenario.

First, when the user accesses the application, he requires the create account page the app shows him the page to enter his information(user name full name password phone number ...) and then validates his data by clicking on the create account button. Then the system checks whether it is a member or not.

if it is the system sends a notification to the user that the account already exists, if not the system sends a notification that the account has been created and shows the login page.

1. The following figure illustrates a detailed description of this scenario

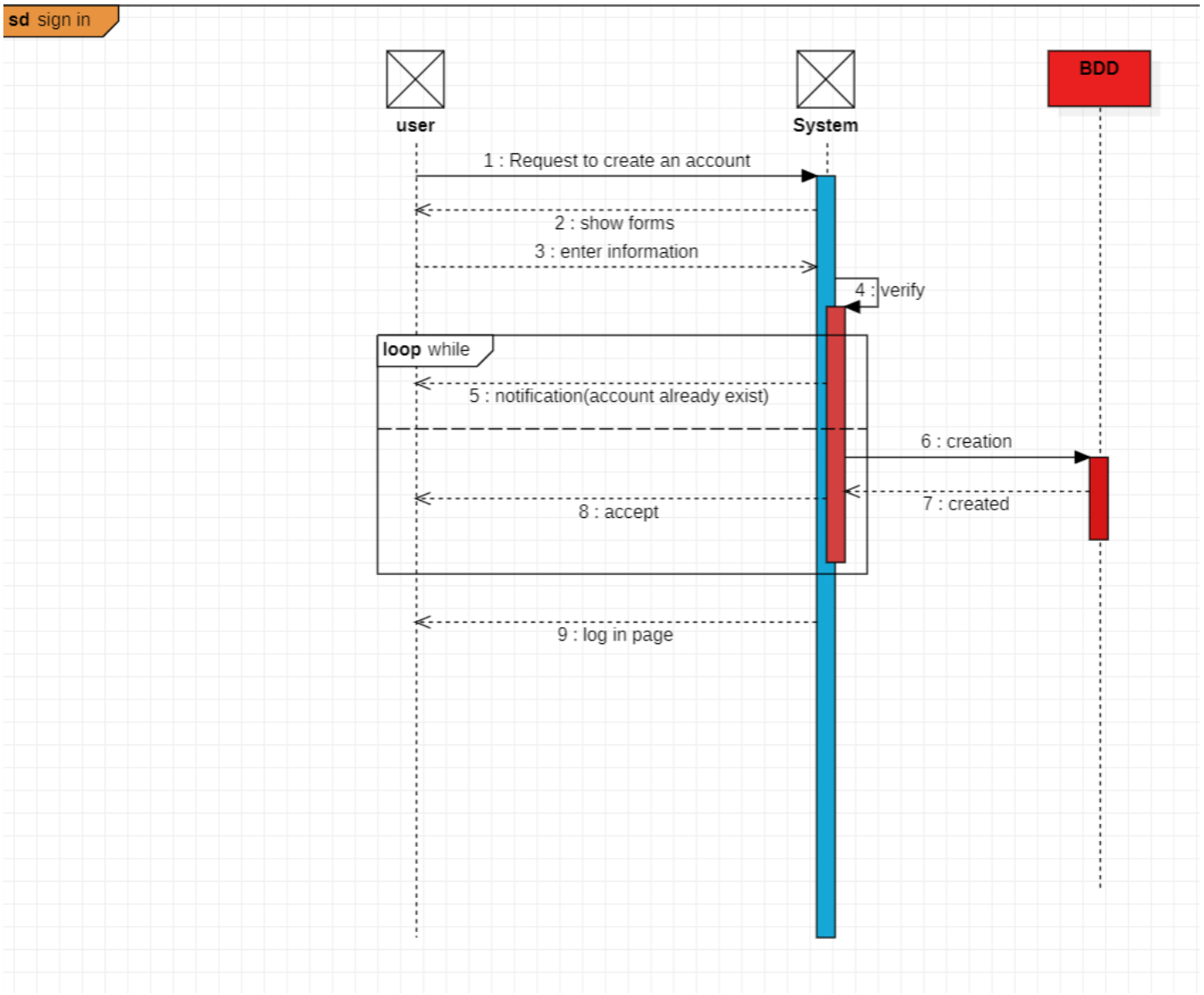

Figure 4.5: Sequence diagram sign in parte

2. In this part, the user requests the login page, and the application shows it to him, then he enters the username and password. The system verifies the validity of the information entered, and if it is correct, it moves to the main page, otherwise, it stays on the same page and sends a notification that the information is incorrect.

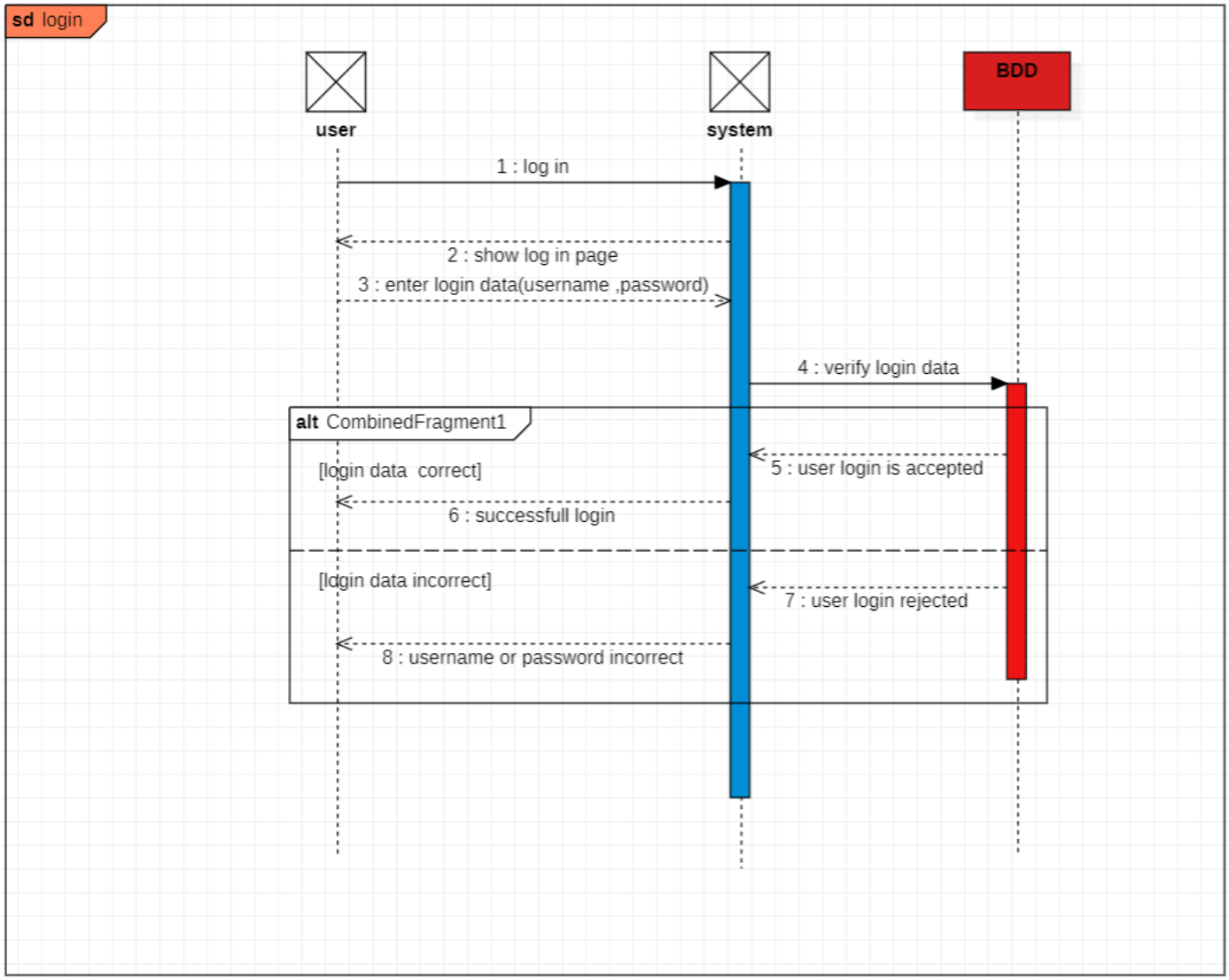

Figure 4.6: Sequence diagram log in parte

3. in this part, the supervisor requests the levels page, and the system presents it to him, he chose the current level for the child, then the system presents the lesson page, the child does the lesson, then the system presents the exam page, so the child does the exam and while his answer is incorrect the system keeps on the same page and shows a notification that the answer is incorrect ,until he give the correct answer, after that presents a congratulation page and the system saves the answer in the database.

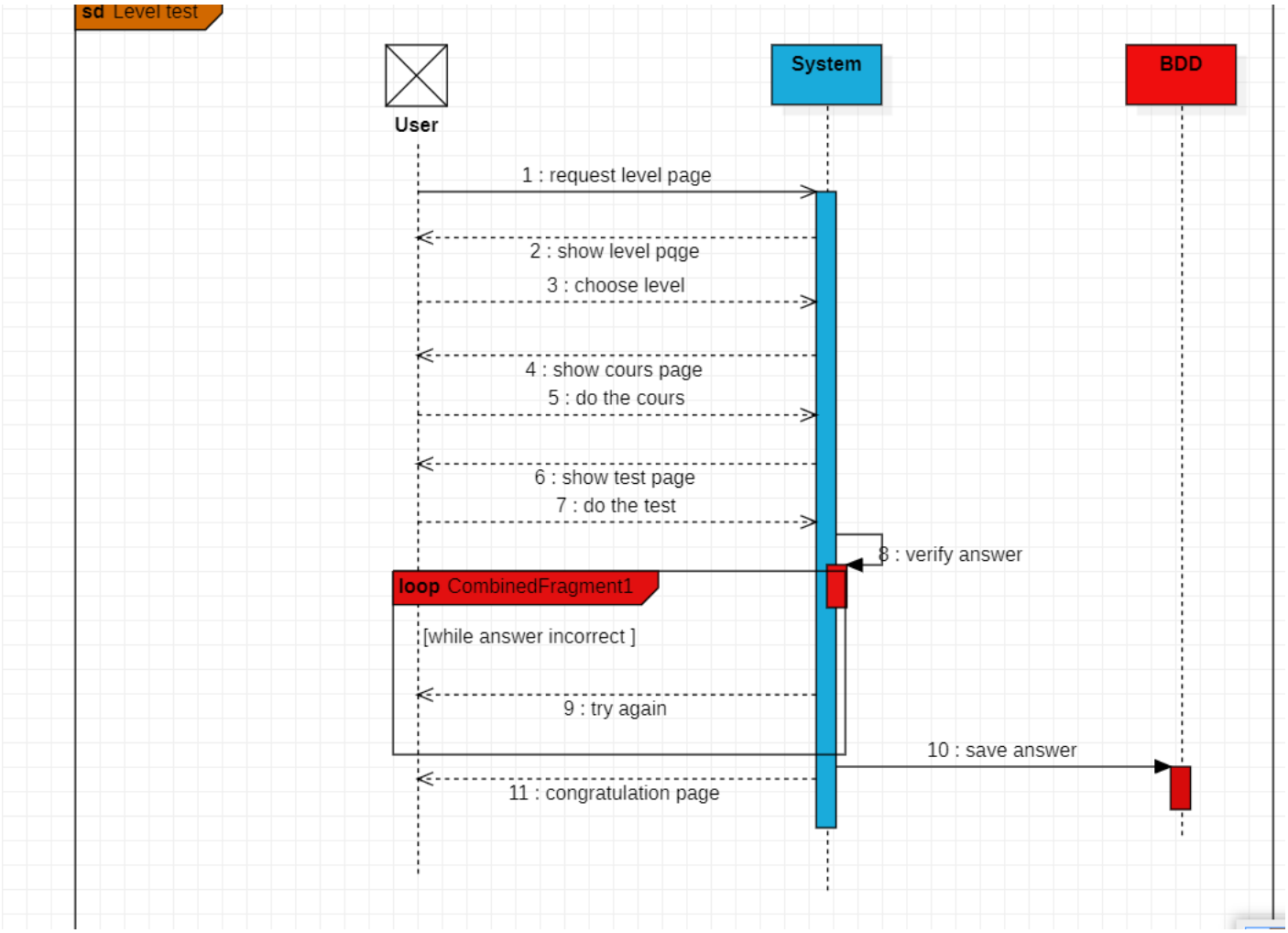

Figure 4.7: Sequence diagram test level parte

Class diagram: is generally considered the most important in a object-oriented development, It represents the conceptual architecture of the system, it describes the classes that the system uses, as well as their links, that these represent nesting conceptual (inheritance) or an organic relationship(aggregation) .

1. The class Diagram consists of login (name, surname, username, date of birth..) When registering, the levels interface appears for each level that is formed From courses and tests, each of which contains pictures and voice. The last level, consists of scenes, Then the supervisor evaluates the child

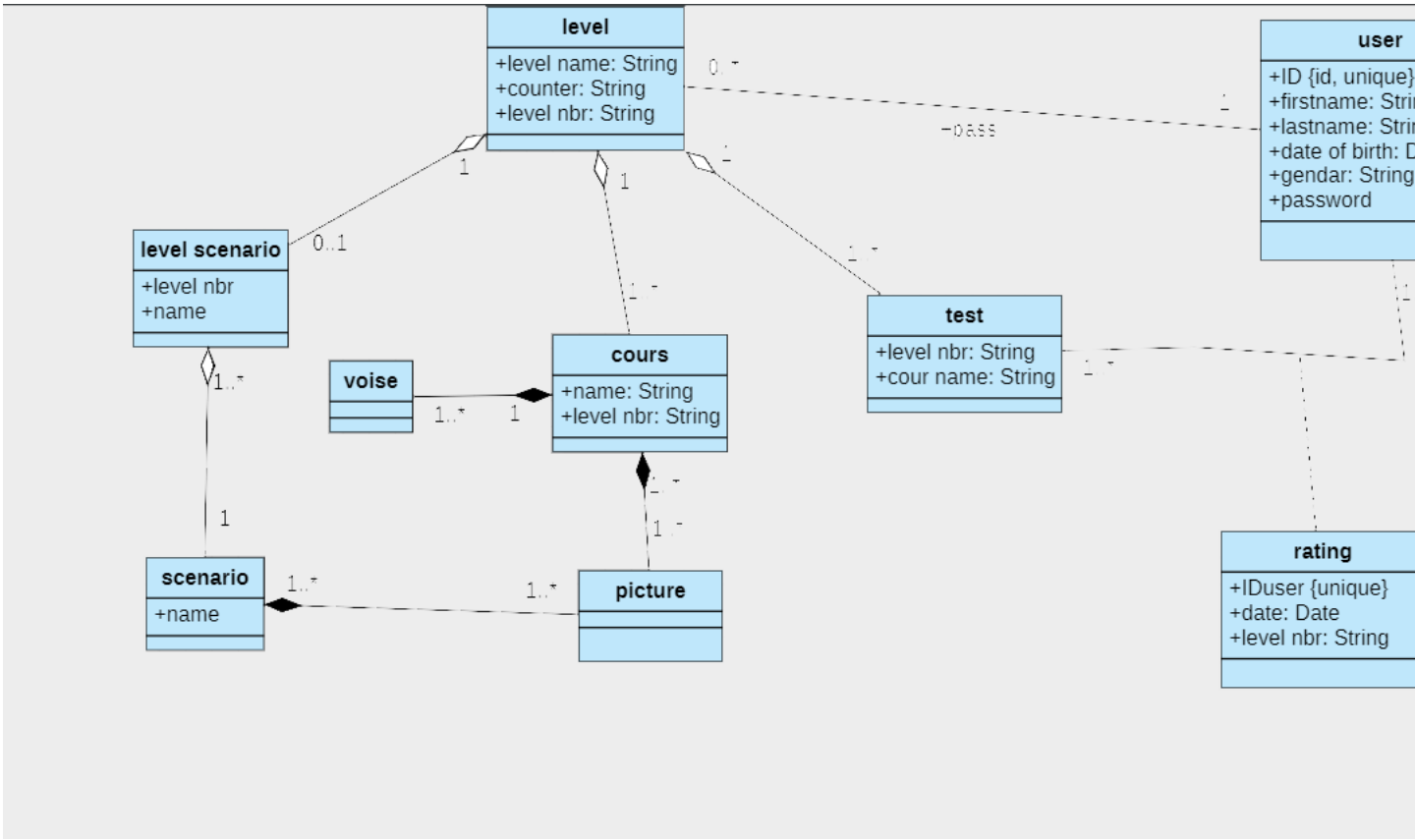

Figure 4.8: Application class diagram

4.8 Conclusion

In this chapter, we have presented the UML diagrams necessary for the realization of our application.

We first described the use cases by listing in a textual way all the interactions between the actors and the system followed by a diagram of the use cases, then we completed this textual description with diagrams sequences.

In the end, defining the relationships between the entities, we managed to design the class diagram. This allows us to start the development of the application.

Chapter 5

Implementation

5.1 Introduction

After detailing the analysis and design of our application, this chapter is devoted to the implementation part. We will first present the hardware and software environment and some libraries used in our application, then we will talk about the phase implementation of the database, and at the end we will present the different interfaces of the application.

5.2 Development Environment

The various hardware and software tools used for the realization of our application are in the following:

Material Environment

For the realization, we used an HP laptop computer characterized by:

1. Processor: Intel core i5
2. RAM: 8 GB
3. Hard disk: SSD
4. System: Windows 10, 64 bit

Software Environment

The development environment used in our application is Android Studio, and different APIs

(Application Programming Interface) which are:

Android Studio

Android Studio is an integrated development environment (IDE), created by Google to develop Android applications. It was announced in 2013. Android Studio is based on IntelliJ IDEA software from JetBrains, and it is freely available under the Apache 2 license It allows to edit configuration files (gradle and Manifest), source code files (Java , Kotlin) and to use libraries and add assistant files (fonts, media. . .) to make it easier for us to develop our application.
We used Android Studio as version 2022.1.1 and Java as language for source code. [34]

(a) Android Studio official logo (b) Android Studio icon JDK

Figure 5.1: Android Studio official logo, Studio icon Android

Java development Kit (JDK) is a set of basic Java language software libraries.
The tools with which Java code can be compiled and transformed into byte code intended for the Java virtual machine [35].

Figure 5.2: JDK Logo

Adobe Illustrator

Illustrator is a graphic design application. It used to create vector graphics. Vector images and graphics are made of points, lines, shapes, and curves based on mathematical formulas rather than a set amount of pixels, and therefore can be scaled up or down while maintaining image quality.

So, vector artwork can fit different sizes — larger or smaller — without losing any detail [36].

Figure 5.3: Adobe Illustrator logo.

5.3 Database Implementation

For mor security we used the Firebase database which is of the No SQL type.

Database Implementation

NoSQL

No SQL, for "not only SQL", i.e. not only SQL. Refers to databases that are not based on the classic relational database architecture. Originally developed to manage big data.

Firebase

Firebase is a BaaS (Backend-as-a-Service), which has evolved into a next-generation application development platform on the Google Cloud Platform
It offers to host in NoSQL and in real time databases, content, authentication and even notifications. Launched in 2011 under the name ENVOLVE, by Andrew Lee and by James Templin [37].

5.4 Why we Choose Android As Our Operating System

The Android system gives you a lot of flexibility, allowing you to customize your device interface and is simple to use. You can choose from a variety of themes, icons, fonts, keyboards, and more to personalize your Android so it looks exactly how you want. Some Android devices, including Samsung phones and tablets, even allow you to change the navigation settings so you can use your device to make the experience your own.

What Are The Advantages Of Android Phones?

- **Organize your files using the folder system**

  The folder system present in Android makes it easy to sort through the content on your phone or tablet. Rather than endless scrolling, you can use the folder system to see images, videos, documents and downloads separately. You also have the flexibility to organize your documents and content your way. Folders help you manage many applications you have on your device and allow you to organize your phone to suit how you work, not the other way around.

- **USB type-c connectivity**

  It's never been easier to transfer data or charge in a flash. USB type-C gives you faster data transfer speeds than previous USB types. It also allows for increased charging

capability, enabling Fast Charging on our Galaxy phones. You can even get a big-screen experience without the need for a dongle. Just
connect to USB-C enabled monitors and projectors directly through your phone or tablet.

- **Memory Expansion**

  Running out of space for files? No need to delete your beloved photos, videos, and apps. Many Android smartphones come with the option to expand your memory using a microSD card. Our Samsung Android phones, including the Galaxy Z Fold4 come with up to 512GB, meaning you won't have to compromise on what files you get to keep.

- **Easy setting**

  The Android notification bar makes it easy to find and change settings on the fly. Swipe down and you can press and hold any icon to access its settings, including Wi-Fi, Bluetooth, brightness and more. You can even customize your notification panel to put your most important features first. If these icons don't show you the setting you want, just tap the settings icon in the corner to access the settings app.

- **Access app info from your homepage with widgets**

  Widgets were created by Android to make your life easier. They act as shortcuts for accessing app information straight from your home page without opening any apps. For example, the calendar widget lets you see your schedule at a glance. These shortcuts available on Android make your smartphone work better for you, creating ways to make your most frequently performed tasks simpler.

5.5 Overview Of The application

-In what follows, we present the fruit of our work by exposing the different interfaces of the application, Starting first, with the app logo.

Figure 5.4: App Logo

Application interfaces When the user launch the app appears the start page which contain log in and sign in buttons.

Figure 5.5: Start Window

Login

-For members, who are already registered in the application.

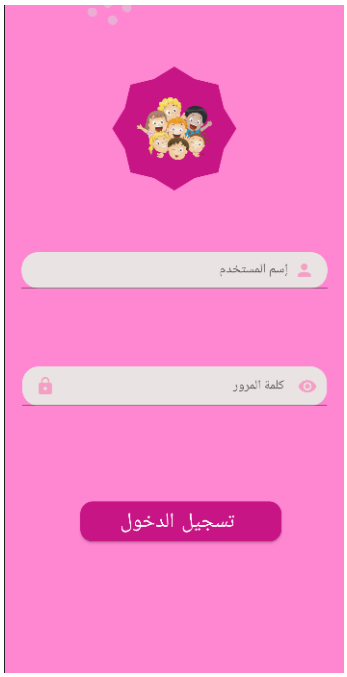

Figure 5.6: Login Window

Register

-To create a new account.

Figure 5.7: register Window

The main interface of the application

Figure 5.8: The Main Interface Of The App

Levels Interface

Figure 5.9: The Levels Interface

Figure 5.10: learn Interface

Learn Interface

Interface of level (1)

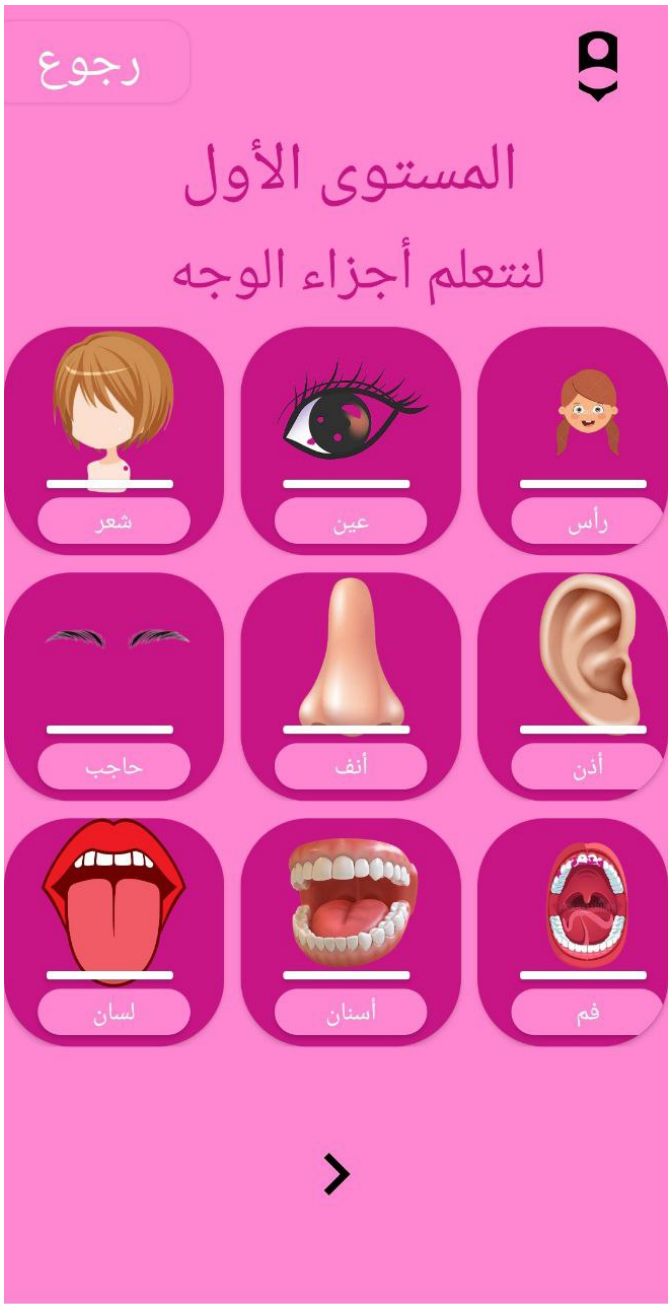

Figure 5.11: Interface of level (1)

5.6 Conclusion

In this last chapter, we presented the development environment of our application and the different tools and libraries used. Afterwards, we presented the different interfaces of our application. We take seriously to respect as much as possible the standards of the HMI to realize our application.

General conclusion

In this study, we presented a solution to one of the problems that autistic children suffer from, which is expressing their feelings and understanding the feelings of others. This solution was an application

Where we developed it using programming techniques, including Android Studio, also Java as a programming language

Despite the difficulties that we encountered in producing this application with the desired specifications, we hope in the near future to increase its characteristics for effective and better use.

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