3D Sensor Based Educational Game For Preschoolers

Vision Impossible

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1 Problem Definition and Background Information

Games have always been used to improve children's skills, since they have been very attractive for every child especially for the preschoolers. However, in today's world, computers are becoming kindergarten of children because the attractiveness of video games increased sharply with the advances in video games industry in few years. Although this kindergarten is capable of providing facilities that can support early childhood development, the companies in the area does not prefer to develop such solutions. This leads to a generation with high possibility of being obese, and experiencing physical and intellectual disabilities, which is due to the lack of movement in front of the computers, and educational content in the video games.

Parents are the other group of people who are also the actors of the problem. All parents want their children to develop normally in terms of physical and intellectual abilities, and learn everything which children of that age should learn. However, due to reasons mentioned above, the children live in the world of video games instead of playing with their friends, and educating themselves.

1.1 Scope of the Problem

Since the video games are spread to all computers and mobile devices, this problem is seen where they are used, namely all over the world. In fact, the threat posed by the problem gets bigger in some locations such as cities which do not have enough playgrounds for children.

Since everyone has been a child once upon a time, we may say that everybody has been affected by this problem. However, if someone wants to know the population of the children who are 4 to 6 years old, i.e. preschoolers, the number is approximately 450 million. We calculated this number from information provided by Worldometer[1]. There are 1.86 billion children between age 0 and 14. We assumed that number of children for each age is distributed uniformly. Thus, we end up the calculation by dividing 1.86 billion to 4.

1.2 Solutions to the Problem

Psychologists and early childhood educators are the people who have been attacking the problem. Their approach is based on keeping the children away from the computers, and mobile devices. Even though it seems as a good solution in theory, it fails most of the time since the video games are too attractive to them, and the game technology advances too rapidly. Therefore, computer engineers are nowadays involved in this area. Since mobile devices are very popular currently, they focus on educational applications. Although there are lots of such applications in the stores, they do not solve the physical development problem at all. Intellijoy[2] is the company whose applications are the most popular ones among the hundreds of educational games in the stores. The company's products are focusing on teaching alphabet, reading, numbers and shapes. Another solution is based on a 3D sensor, namely Kinect[3]. The company Kinems[4] is the only one using 3D sensors to attack this problem. Their products are about motor planning, memory, math, and linguistic. However, their solutions are separate from each other, which means there is no story to follow in them.

2 Significance of the Problem and Motivation

People of all ages are attracted by the video games; thus, the game industry is growing too rapidly. The products that have been developed so far offer just fun for the players. This may not cause any problem when the players have completed their childhood development. However, children are different story. They need to be educated while they are growing up.

Nowadays, it becomes harder and harder to remove our children from video games. We thought that instead of removing children from games; let's use games to educate children. That is why we want to solve this problem. We didn't consider about other public project ideas, since we are started to think solve this problem long time ago. Since source of the most psychological problems are coming from childhood, if we lessen these problems that makes world more livable, which is another issue we would like to solve.

There are two main challenges in our problem. One is from engineering perspective and the other one from educational perspective. The first one is that we will not use any SDK (software development kit) that is provided from 3D sensor. Instead, we will process the 3D data ourselves to make the software cross platform, which is a problematic issue. The second challenge in engineering side is about real time operations. Since the project is going to be a game we need to process data and render scenes fast and efficiently. The second perspective is about education of children which have age between 3 and 6. We need to educate children while they are enjoying from the game. To make this, we are going to consult some domain experts which are in the field of early childhood education and psychology.

The problem has been seen since the beginning of the 2000's. With the fact that personal computers and mobile devices have been important parts of our lives, the new generation has just started to grow up with computers. Hence, the importance of the problem has not been perceived totally yet. The companies in the industry are not interested in it because they do not think that the area is profitable enough. Some of the solutions developed so far are the books designed for childhood education and the kindergartens. However, these solutions cannot keep the children away from non-educational, only-fun computer games, since they only focus on education. There are also some mobile solutions that plan to teach children while enjoying them; however, they are actually missing the point. Mobile devices or personal computers force people to sit and stay still. In the case of children, this prevents them from developing motor skills.

Although the product that is to be developed at the end of the project cannot be used as an academic product in the perspective of computer engineering, it is going to be very useful for psychologists and early childhood educators. It might be modified to do experiments on children. It can be used to develop new educational methods, to compare existing ones. There is also the possibility of modifying it to use for children with disabilities, or Down's syndrome. Since we work together with psychologists and early childhood educators, this project can be turned into an academic product with their want. The project can also end up with entrepreneurship because it is planned to be the only perfect solution.

3 User Story

Role	Action	Goal
Developer	I want to check whether the player is close enough to the sensor	so that I can decide whether gestures can be recognizable or not.
Developer	I want that the player shall do simple dance figures	so that s/he can develop his/her motor skills.
Developer	I want that the player shall match the figures on the screen	so that s/he can learn shapes
Developer	I want that the player shall play dot connecting game	so that s/he can learn counting
Developer	I want that the player shall complete puzzles	so that s/he can develop associating abilities
Developer	I want that the player shall play card matching game	so that s/he can develop memory skills
Developer	I want to upload the updates to the users' machine automatically	so that I can supply long-term support to users
Developer	I want to check whether the player hears the sound or not	so that the commands can be given to the users
Developer	I want to check whether the sensor is on or not	so that the player can be recognized.
Parent	I want time limitation for the game	so that my child cannot spend so much time for the game
Parent	I want a secure system for sensors	so that nobody can not watch my child by using sensors
Parent	I want that, the game does not include any +7(or adult) content	so that my child does not affect from game negatively
Parent	I want to see progress report about the skills developed	so that I can track the progress of my child
Player	I want that the game is paused if no player is front of the camera	so that I don't miss the game
Player	I want to see a list of game categories	so that I select the category that I want
Player	I want to save my game data	so that I won't lose my progress
Player	I want to load my game data	so that I can continue from where I am
Player	I want to see progress report about the game	so that I can track the progress of myself
Player	I want to be able to start a game with new account	so that other children can play the game without interfering my account
Player	I want to be able to pause my game	so that I can take a break without quiting the game
Player	I want to see my total points	so that I can see what I can buy from the game store
Player	I want to buy items from the game store	so that I can make my avatar look pretty

Player	I want to be able to ask for repeating the game instructions	so that I don't miss the game instructions
Player	I want to be taught about how the game is played	so that I can play the game correctly
Player	I want to see my avatar in details	so that I can see my avatar progress, previous items.
Player	I want a quit button	so that I can quit from the game
Player	I want to be asked to verify quit after I press the quit button	so that I don't quit the game by mistake
Player	I want to see a list of games from the selected category	so that I enter the game that I want
Player	I want to see my points after the game is finished	so that I can figure out how good I played
Player	I want to play the game using a 3D sensor of any kind	so that I do not have to buy new hardware for the game
Player	I want to move my saved data to another game console	so that I can play with other game consoles
Player	I want that if camera sees another person behind me, it ignores them.	so that others cannot interrupt my game
Player	I want that the gestures are correctly recognized at least %80 of the time	so that I can play the game flawlessly
Player	I want to see the effect of my gesture simultaneously	so that I can keep up with what is going on in the game
Player	I want to see high quality graphics	so that I can easily recognize the scene

4 Support

InfoDif [5] will lend us several 3D sensors and they will contact big manufacturers for sponsorship. They plan to discuss with Microsoft Turkey, Intel Turkey and Dell Turkey for getting related hardware from them.

In worst case scenario we will have the sensors we need and in best case scenario we will also get a workstation and a 3D tablet as well.

5 References

[1] http://www.worldometers.info/world-population/world-population-gender-age.php Retrieved Oct. 13, 2014.
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[4] http://www.kinems.com/ Retrieved Oct. 16, 2014.
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