



Research on Child Care Robot and the Influence on Children

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Abstract. During the early years of childhood, children need more care from their parents. However, more and more young parents, in order to pursue a better life, go to a strange city and live far away from their parents. This means they have to achieve a balance between bringing children by themselves and doing their daily work. The paper, through the method of literature review, explores the application and development of robots for accompanying children in contemporary life. The paper finds that the robot for children's nursing is really important in today's world, but it still has a long way to go.

Keywords: robot, children care, childhood, children companion

1 Introduction

With the evolution of the industrial structure in a global context, more and more family structures tend to be small and nucleate. This leads to less and less communication and interaction between the parents and their children. Thus, to meet the need of accompanying their children and supplying excellent protection to them when parents are not at their children's side, robots for child companions are emerging in the market.

With the continuous optimization, upgrading, and comprehensive refinement of children's intelligent robots, children's robots can help children meet the needs of surrounding security monitoring, interactive learning, and entertainment. The robots can be beneficial to children's growth and parental care. The rapid growth of internet intelligence products, the continuous development of large data sets, as well as a variety of intelligent technology progress step by step, children's intelligent robot rapid progress, rapid development in just a few years from the start of simple only point-read function of children's intelligence, machine learning, and development to the present child intelligent AI education robot and various types of high-tech children's robot. It can be seen that the children's robot is gradually transitioning from a single function to a high-tech intelligent comprehensive nursing robot.

Through the method of literature review, the paper discovers the area of the age between three and five years old kids' needs and preferences in color, shape, psychology, and so on. At the same time, the paper focuses on the design of the robot in different functions.

The research aims to introduce more people to the role and development of child care robots, break the stereotype of the public that child care robots are still in the stage of low intelligence, and attract more social resources to pour into the field of child care robots so that they can have long-term development and benefit more families. Besides, this paper will also provide suggestions on design according to children's needs and preferences (such as materials and colors), so as to better promote the robot to better serve children and satisfy market demands.

2 Analysis the research for the user of children

2.1 Children's physical preference

Visual features: Everyone's feelings about the color are different. With our growth, the ability to feel the color is strengthened. [1] As adults, they have various preferences for different colors, like the Moranti color scheme. But for 3–5 year old children, they don't have so much difference between each other in choosing their favorite color [2]. They may prefer some bright colors like red and yellow. From the point of the research of children's color psychology, red, yellow, and blue are such high purity colors that children have a more profound impression of this kind of color, and lower hybrid purity colors are not easy to understand. A high degree of being fond of no bright pure color-black, which is an adult favorite dark color, does not conform to the interests of children and can even lead to a bad mood.

Children between the ages of 3 and 5 can already analyze the basic shape of their surroundings, but they cannot define much detail from the shape of the objects. As the ability to feel the color increases, children's feelings of the shape also increase with their growth.

Children at 3-5 are incapable of feeling the exact shape of the objects (they make out general shapes but not a lot of details), so bright colors can be more significant to be used on the robot for child care than the amazing shape of the robot. Children adore the round shape of their favorite cartoon character's appearance.

When children are between the ages of 3 and 5, hearing is even more important than vision for their perception of the world. So many parents will cultivate their children's musical sense in this period. Because hearing develops faster than vision, children can identify their parents' emotions by hearing rather than by sight. [3] Exaggerated and high-pitched sounds can arouse children's curiosity and also stimulate their desire to explore new things. ([4] Similarly, happy and cheerful sounds can put children in a good mood. Therefore, when designing robots, the speech should be distinctive, both exaggerated and clear, and the structure of sentences should be easy for children to understand rather than obscure.

2.2 Children's psychology

Children who rely on their parents: It is common that children rely on their parents between 3–5 years of age. The consequence is not only the situation that children rely on their parents but also has a huge impression on them during the rest of their lives. Thus, this kind of dependency will decrease with the growth of the children. In order to make a Sheffer during their childhood, the robot for child care needs to take this feeling into consideration. [5]

The desire for discovery: As children are still young, they have a lot of things that they have not experienced, so they have a great curiosity and desire to explore the world, which should be taken into account when designing the robot.

Taking action on their first motion: Children have changed a lot since they were babies. They take action to experience and understand the world around them, but this is often dangerous because children lack common sense. At this time, we need parents' care, companionship, and guidance, which are also very important factors that should be taken into consideration in the robot design (they should make sure that the children are safe).

For children, increased and improved motor and sensory abilities make them eager to learn about the world. Imitating the behavior of others, not necessarily referring to human beings but animals, is likely to become their habit in the future, so it is very important to have a correct code of conduct since childhood. This requires parental help. Therefore, in the design of the robot, the appearance should be pure, the language and actions should be kind, and the timely monitoring and feedback of children's behavior should be made as much as possible, so that dangerous behaviors and bad habits can be controlled.

Passion for games: Games can experience a lot of things that have never been experienced before, but also exercise their abilities. In addition, children at this stage love playing games at the age of four, and the process of games can exercise comprehensive ability. So nursing robots can have certain entertainment functions.

At such a stage, the child's psychological development continues to grow to a certain stage, where they start to have their own emotional expression. [6]. Children also experience other people's feelings and understand them in their own way [7].

2.3 Color and shape

Visual perception is a major factor in the recognition and understanding of external objects. Color can directly affect children's emotional feelings by stimulating their visual perception. As children get older, they develop their own understanding and preference for color, and the general trend is to shift from bright colors that are obvious to colors that are coordinated and balanced. Therefore, the color design of the robot needs to achieve a color balance, and it is not recommended to use a lot of chaotic colors.

2.4 Children's need of child nursing

Children in the rapid development stage, aged 3-5 years old, constantly improve their self-cognition and are eager to receive attention from their parents. However, their psychology includes quite unstable factors like thoughts, emotions, and so on. If children at this stage lack their parents' support and timely guidance, they may create some negative introversion. Therefore, children at this stage need more companionship and guidance should be given to children while taking care of them so as to help children have a healthy mind and develop a good personality. [8]

3 Design for the child care robot

There are so many kinds of robots for children, but those focused on child care only take up a small part of the market. The robot for child nursing is not only to monitor each action of the children but also to work as a friend who plays with the children that are lonely. The robot should provide the feeling of safety and happiness to the children and bring them up in a good atmosphere. Therefore, since the design of a robot is not just a simple accumulation of functions, we need to carry out a specific analysis of the functions of a child-care robot.

3.1 Safety monitoring functions

Children at the age of 3 to 5's safety must be taken into consideration and as one of the most important parts to be designed. Robots for child care should provide protection and monitoring during the time when their parents do not stay with their children. Usually, there are two ways to help the robot achieve the goal of protecting the children: one is by monitoring the area where the children usually show up; the other is that they can make a prediction of the dangerous situation that may happen if the child takes some action. So, when children are considered to be in a dangerous condition, both the children and their parents will receive the notice. This can help the parents quickly interrupt the action that their children are taking, and the children may receive the information in the form of a shake or face time with their parents.

Monitoring the children's activity area: the movement track of the child is monitored and tracked in a specific area and there is real-time monitoring of whether the child is in a safe state.

The robot will not interfere with children's activities in safe areas, but when children are about to enter dangerous areas, the robot will attract children's attention through vibration and shaking, so as to avoid children entering dangerous areas. To avoid the dangerous action, parents can communicate with their children via phone (be content in the robot). Direct communication between children and parents can reduce children's tension, and parents can also tell children what to do in time to avoid danger. This way, we can reduce the probability of encountering the same danger in the future and provide better protection for the children's security.

3.2 Emotional companionship function

Children's exploration of the world is active and enthusiastic. However, at the same time, compared to adults, children are very sensitive. Therefore, parents need to accompany their children more and develop good habits so that children can develop more favorably. [9]. So when we design the robot, we should think about the emotional needs of the children.

In the process of emotional interaction between children and robots, the relationship between "product-child-environment" is important. Children are in the dominant position, and the interaction with the nursing robot is mainly divided into three parts, namely, movement, sense, and emotion. The interaction between children and the environment is the interaction of multiple senses, such as vision and hearing. The environment creates an atmosphere for the interaction of the nursing robot, and the nursing robot also transforms the environment through interaction. [10] Children can record the emotional changes of children and give corresponding expressions, as well as interactive communication methods, chat with children, and play interactive games to help parents accompany their children better and become "good friends" with them, so that children will no longer be lonely and help cultivate their characters [11]. In addition, the children's emotions can be recorded in a week. Parents can understand the psychological changes of children better by recording, finding the ways of interaction that children like, and enhancing the emotional communication between parents and children.

3.3 Communication and interaction function

Children above the age of three have improved language skills and are eager to communicate with the outside world. They have something they want to say. [12] Children at this stage need parents' company very much, and parents' company is something children can truly experience. If children lack the companionship and understanding of their parents at this stage, their future personality development will affect children's mental health. The communication between children and nursing machines can satisfy children's desire to express themselves to a certain extent and, at the same time, enhance the understanding between parents and children, so that children have the feeling of being accompanied and growing up. In this way, children can also be monitored in real time to ensure their safety and reduce the character defects caused by lack of communication.

3.4 Gaming function

Game features need to be entertaining, inspiring, and lively. Through games, we hope to guide children to learn and explore the world through games. This requires our robot to find the balance between entertainment and learning in the game function. Children's interests are aroused when they learn knowledge and improve their abilities. Enhancing ability and learning knowledge is the embodiment of learning, and stimulating children's interests is the embodiment of entertainment. [13]

3.5 Image of robot for child care

The appearance of the design is simple and generous, with lovely color matching. The use of tumbler design reduces the risk of children playing around. An accidental collision will be prevented to protect the safety of children. At the same time, the height of the design is also in line with the needs of children's height. The expression is rich and lovely, focusing more on the emotional companionship of children.

However, there are some issues with the robot, such as the fact that the functions that compete in the robot are so limited to a 3-5 year old child.



Fig. 1. Child Care Robot [14]

Small and light enough to carry around, it can help children read aloud to help them develop reading habits and cognitive skills. However, it lacks the ability to protect children. Although it is strong and durable, it lacks early warning for children to enter a dangerous environment.



Fig. 2. Children's reading buddy [15]

On the basis of interaction design, children and parents will keep good communication through the built-in video function of the robot. Meanwhile, the game function can also remotely accompany children to spend their childhood together. In order to make the video communication more interesting and increase common topics between children and parents, the robot's built-in communication system has some funny stickers to make parents look less serious. Parents can also control the robot through a mobile app.



Fig. 3. Mobile Terminal Interactive Function Design [16]

4 Discussion

With the opening of the two-child policy, the child-based market quickly became active. With tens of millions of babies born every year, some young parents born in the 1980s and 1990s are increasingly willing to spend a lot of money on their children's growth, especially education. In addition, with the rapid development of atypical intelligence in recent years, accompanying robots with educational attributes for children have rapidly become a hot project for entrepreneurs, who devote a lot of energy to the research of the project.

In China, as mothers born in the 1980s and 1990s are generally highly educated, they are more open-minded, independent and want to go to work rather than stay at home as housewives.

However, because of this, young parents have less time to spend with their children. Many children have to become left-behind children. According to statistics, China has 56 percent of empty-nester families, with nearly 70 million children left behind.

Meanwhile, for some children with specific medical conditions, there are often serious social and emotional difficulties. Children with autism, for example, often have trouble maintaining eye contact with humans but not with robots.

Therefore, the robot for child care has become a lot of young parents' intimate little helper. Therefore, this kind of robot has a large market waiting for us to explore.

5 Conclusion

Through the analysis of child care robots, it finds that the robot for children's nursing is really important in today's world, but it still has a long way to go. For example, robots are not as sophisticated in language simulation as humans are, so there are fewer inaccuracies in language recognition when communicating with children. If this communication function makes communication not fluent, children will soon lose interest in communicating with them.

At present, the basic needs of the market for child care robots have been determined, mainly based on the will of parents, who prefer their children to be taken care of safely and emotionally accompanied, but busy parents often find it difficult to accompany their children for a long time. Children's dependence on their parents, desire to talk to them, and learning new knowledge cannot often be solved with the help of child care robots.

There are still many areas that need to be improved in this study. For example, there is a lack of investigation and research on which functions parents and children need and attach more importance to in terms of emotional companionship. Parents should communicate with their children directly. If the parents' way of speaking is not proper, the wrong expression of their feelings will easily lead to a misunderstanding of the children. Whether it can be improved in the future is the direction for us to do further study.

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