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Analysis of the Interaction of Zoomorphic Sociorobots with People

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Annotation: In this paper, various types, characteristics, and parameters of zoomorphic sociorobots are analyzed. During the analysis, the author set the task to consider the possible areas of application of zoomorphic socio-robots, the results of their influence on humans, as well as their further development.

Keywords: zoomorphic robots, sociorobots, zoomorphic sociorobots.

I. INTRODUCTION

Zoomorphic robots are common in many parts of the world, they are used in laboratory research, academic work, and zoomorphic robots act as an excellent companion, which is more common in Japan [1], where many zoomorphic social robots are produced for therapy and entertainment.

Zoomorphic sociorobots (animalobots) have a positive impact on humans in various fields of its application. Social robots are used as a means of socializing people, to maintain their morale, in a situation where a person feels lonely and needs a companion [2]. Social robots entertain people and patients, help, and communicate with the disabled and the elderly, take care of the health of people with dementia and children with autism [3].

Based on this, companies such as Sony, Philips, AIST, Ugobe, Fujitsu, Omron and VUB are actively engaged in the creation of various types of social robots, for example, walking anthropomorphic humanoids, such as QRIO and NAO [4-5], wheeled anthropomorphic humanoids, such as BANDIT [6], stationary robots such as KASPAR [7], and zoomorphic sociorobots.

Zoomorphic social robots not only help people take care of their health, but are also suitable for people who, for whatever reason, cannot get a pet, but really want to. Allergy to wool, frequent travel, employment - all this does not make it possible to acquire a living companion, and zoomorphic sociorobots help in this.

II. ANALYSIS OF ZOOMORPHIC SOCIOROBOTS

NeCoRo is a very realistic robot cat, an unusual pet that is suitable for many people. Residents of megacities, tenants, people with allergies or very busy people do not have the opportunity to get a real cat, so the NeCoRo robot cat is the best way out [8]. The general view of NeCoRo is shown in Figure 1.

The NeCoRo cat robot has 15 motors, which allows it to behave almost like a real cat, but it cannot walk, since it is intended to be in the hands of the elderly, but NeCoRo can stand, sit, stretch, and lie down. This robot has seven sensors and microphones for understanding and interacting with a person [9]. The main technical characteristics of NeCoRo are presented in table 1.



Figure 1. – Robot cat NeCoRo

Table 1. Main technical characteristics robot-cat NeCoRo

Parameter	Values
Battery	Replaceable nickel-hydrogen
Working hours	1,5 hours
Full charge time	2 hours
Dimensions	320*260*220mm
The weight	1,6 kg
Price	~1500\$

NeCoRo is endowed with her own emotions and desires and can also change her character and personality depending on her upbringing.

In the article Masahiro Fujita, the author presented the first AIBO robot model, which is used for use as a pet. The author proposed a solution to the problem of significant realism in the appearance of a zoomorphic robot by complicating the movements and transmission of this robot.

As a solution to the problem, the authors used multiple constraint motivation, high freedom constraint, and unusual behavior [10].

Sony has developed the latest AIBO robotic puppy. The company has combined artificial intelligence and advanced technology to create the perfect companion and family member. Thanks to deep learning, AIBO can grow and develop, form a unique personality through daily interaction with people [11].

Sony has used a wide range of different sensors, cameras, and actuators to make AIBO look like a real dog. The robot dog has ultra-compact drives that allow the body to move along 22 axes.

AIBO is equipped with built-in sensors to detect and analyze environmental sounds, has 2 OLED displays that are used for eyes and create different facial expressions. The general view of AIBO is shown in Figure 2.



Figure 2. – Robot dog AIBO

AIBO is equipped with a quad-core processor, Wi-Fi and LTE modules, gyroscopes, a camera and four microphones [12]. The main technical characteristics AIBO are presented in table 2.

Table 2. Main technical characteristics robot-dog AIBO

Parameter	Values
Microprocessor	Qualcomm Snapdragon 820
Working hours	2 hours
Full charge time	3 hours
Dimensions	180*293*305mm
The weight	2,2 kg
Price	~2900\$

AIBO is an ideal dog for pet owners who travel a lot and do not have the opportunity to feed or walk their pet [13].

AIST, a leading industrial automation company, has developed PARO, an interactive therapeutic zoomorphic social robot for hospitals and advanced care facilities where live animals would present logistical or treatment challenges.

Through a series of studies, the company has found that PARO reduces patient and staff stress and enhances and stimulates interaction between patients and facility workers. PARO has a positive psychological impact, improves relaxation and motivation, and improves socialization [14].

The prototype of this robot is the harp seal breed, as the most charming animal on the planet. The general view of PARO is shown in Figure 3.



Figure 3. – Robot seal PARO

PARO has five types of sensors, thanks to which it perceives the environment and people, recognizes the time of day, sound direction, name, greeting and praise. Imitates

the sounds of a real seal, expresses feelings through body movements and facial expressions.

The PARO robot comes in a variety of sizes and colors to suit different ages of people. The cost of this therapeutic socio-robot reaches several thousand dollars.

California-based UGOBE has developed the Pleo, an autonomous dinosaur robot. The prototype of this robot was the North American herbivorous dinosaur Camarasaurus, who lived in the late Jurassic period about 150 million years ago. Pleo acts independently and expresses its emotions through movements and sounds [15]. The general view of Pleo is shown in Figure 4.



Figure 4. – Robot dinosaur Pleo

Pleo is equipped with 14 motorized nodes, 2 microphones, 8 sensors and four paw detectors for surface recognition, 14 thrust sensors, two speakers and an infrared mouth sensor for detecting the presence of an object in the mouth. Pleo also has a USB port and a memory card slot. The main technical characteristics of Pleo are presented in table 3.

Table 3. Main technical characteristics robot-dinosaur Pleo

Parameter	Values
Microprocessor	2 32-bits
Subprocessor	4 8-bits
Battery capacity	2800mah
Full charge time	4 hours
Dimensions	20*33*13mm
The weight	1,3 kg
Price	~500\$

Pleo provides the ability to update the software, thereby upgrading the functions.

III. CONCLUSIONS

After analyzing various models of zoomorphic sociorobots, we can conclude that in case of problems of socialization, it is important and correct to introduce robots that can relieve the emotional burden on a person, relax and reduce stress.

Zoomorphic social robots have been used in numerous environments to test and evaluate their possible social interaction. According to the results of numerous experiments, social robots have a positive effect on the health of patients, improving the emotional background, as well as the level of socialization in the team. Social robots have found application in hospitals and care centers for the elderly, they help with human developmental deviations, such as autism or dementia.

Robotic animals in their appearance and behavioral habits are like their biological species and can replace pets

in the absence of the opportunity to have a live pet. Zoomorphic sociorobots are suitable as a constant companion for people who live in an active rhythm, travel often, or are allergic to the fur of real animals. Also, the Zoomorphic socio-robot can be used to teach a child the behavior and care of a future pet.

In the future, the development of zoomorphic socio-robots will make it possible to use them both in a state of war, for moral support and mood of the military, and can also help them in intelligence, and to help and support people who have experienced loss or other life difficulties.

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