Беспрозванных Ольга Олеговна
Тюменский государственный университет
Институт математики и компьютерных наук
Студент бакалавриата
Группа ИБ146
olyab261@gmail.com
Мурзакова Александра Андреевна
Тюменский государственный университет
Институт математики и компьютерных наук
Студент бакалавриата
Группа ИБ146
alexmurzakova@gmail.com
Мурзакова Екатерина Андреевна
Тюменский государственный университет
Институт математики и компьютерных наук
Студент бакалавриата
Группа ИБ146
katrinmurzakova@gmail.com
Шутова Елена Юрьевна
Тюменский государственный университет
Институт математики и компьютерных наук
Кафедра иностранных языков и межкультурной профессиональной коммуникации естественно-научных направлений
Старший преподаватель
eushutova@mail.ru

ТИПЫ РОБОТОВ-НАСЕКОМЫХ И ИХ ПРИМЕНЕНИЕ
TYPES OF INSECT-ROBOTS AND THEIR APPLICATION

АННОТАЦИЯ. Данная статья посвящена различным видам роботов-насекомых. В статье представлена информация о Роботах-водомерках,

Русском роботе-таракане и Робопчелах. Основной целью является описание особенностей поведения роботов-насекомых, их принципа работы и основных черт. Основные сферы применения и дальнейшие пути развития роботов также описаны в данной статье.

ABSTRACT. This paper is devoted to different types of insect-robots. There is some information about Bug bots, Russian robot Cockroach and RoboBees in this paper. The main purpose is to describe traits of behavior of insect-robots, their principles of operation and main features. The major spheres of application and ways of future developments of these robots are pointed in this paper.

КЛЮЧЕВЫЕ СЛОВА: роботы насекомые, роботы-водомерки, Русский робот-таракан, робопчелы, применение роботов-насекомых.

KEY WORDS: insect-robots, Bug Bot, Russian robot Cockroach, RoboBee, application of insect-robots.

Nowadays, there is an active automation of many processes in different fields of our everyday life.

In process of time, people create more new and powerful robots that allow facilitating our daily lives and sometimes performing impossible tasks for humans. Therefore, robots that simulate living creatures, particularly insects, are designed for these goals.

The projects of the creation of micro-robots have such purposes as the design of small-scale power storage, manufacturing to create movements of real insects, sensing, control multiple, independent robots. Getting from bird size to insect size is not a simple matter of making everything smaller.

One of the modern robots named Bug Bot is insect-robot designed by Seoul scientists, which can perform complex movements, by jumping on water, without water's surface tension breakdown. Scientists learned integrity between nature and its' creatures to do similar to nature-made object.

It is necessary to say about the comparison water striders with iterative prototypes of their robotic insect. Insect-robot is capable exert up to 16 times its own

body weight on the water's surface without breaking through. Robots do it without complicated controls.

Performing jumps on water is trickier than on solid ground. However, water striders have to jump as high on water as they do on land, when exposed to danger.
Prototype of robot borrowed many features of behavior and activity from the basilisk lizard. These robots are same more with lizard than the water striders.

Water skimmers are perfect example of so-called «physical intelligence». Its feature lies in detection of capability of unusual motion with effective jumps on water's surface.

For design of robot, the catapult mechanism was used. It was based on such insect as flea. Therefore, bug bots are able to jump 14 cm. The robots' building includes self-assemble composite materials, which are able to fold like principle «pop-up» in 3D books.

There is another type of insect-robots named Russian robot Cockroach. This robot was exploited by researchers at the Immanuel Kant Baltic Federal University in Kaliningrad led by Aleksey Belousov.

The team faced with such tasks as development of robot, which is similar to a cockroach, repeating precisely a motion and having the same size as a roach.
This robot was built according to characteristics and features of Blaberus craniifer.

The team joined efforts to create the robot according to project's budget and fixed term; moreover, foldable components were developed from scratch.

Velocity of robot Cockroach is three times less than the speed of real-live cockroaches. Nowadays robot Cockroach runs for 20 minutes, so the team of designers wants to increase time of activity and add navigation system to compose routes for the moving.

The important thing is that robot's capability to carry up to 10 g interested the Russian soldiers in using this robot with a camera for transfer into narrow spaces. It has light sensors, contact and non-contact probes, so that this robot can move without connecting any obstacles.

Another type of insect-robots are RoboBees. This project is supported by the investigations, based at Harvard's School of Engineering and Applied Sciences, microelectronics firm Centeye and others.

The RoboBees project explores fundamental questions in materials science, fluid mechanics, controls, circuit design, manufacturing, and computer science.

Bees may be capable of performing airborne acrobatics, but they cannot swim underwater. In an improvement on Mother Nature's design, US engineers have created a RoboBee that is able to dive and swim. RoboBee could pave the way for the development of "flying submarines" - vehicles that can seamlessly travel through air and water.

However, creating a miniature flying machine is not as simple as creating something that can take off and land while attached to a wire.

The microbot is smaller than a paperclip, it is powered and controlled using a lightweight tether wire and can perform agile manoeuvres like insects. A flying machine that size does not have much room to carry a computer and a battery.

By isolating and modeling such functions as vision and sense of smell, the researchers hope to provide their flying robot with the cognitive power required to perform basic tasks without a set of pre-programmed instructions.

To make possible the transition from air to water, the team of designers first had to solve the problem of surface tension.

The RoboBee is so small and light that it could not break the surface tension of the water at first. The researchers worked out a way of making it hover over the water at a certain angle, before shortly switching off RoboBees wings. By doing this, the RoboBee is able to crash into the water in a controlled way and sink.

The creating of programmed insects possessing special intellect and knowledges will be invaluable contribution in development such spheres as:

- Military industry (finding of mine on the field, spying, penetration in hard to reach places, searching of people are under the rubble)
- Medicine (learning of structure of people's brain, beginning with brain of insects)

- Law enforcement (finding of toxic narcotic substances by smell recognition, traffic monitoring).
- Science (aspiration to study the nature and to repeat its uniqueness).
- Environmental problems (controlling a degree of water pollution, pollinating fields of plants, weather and climate mapping) and others.

Designers have reached determined results in process of creating of insect-robots. Sure, large part is uninvestigated, but ways of future developments are already have pointed.

Despite the fact that nowadays most insect-robots are used in military industry, in the future they will be able to make our lives easier and safer. Development of micro-robotics is significant stage of further research, plan and design innovations in different fields of human activity.

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