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Book 5

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BOOK 5

"MATHEMATICS, INFORMATICS AND PHYSICS"

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BOOK 5

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DAILY LIFE APPLICATIONS OF THE MODULAR SELF-RECONFIGURABLE ROBOTS

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Abstract: *The usage of robots and particularly of the modular self-reconfigurable robots is still very rare. The current paper focuses on some daily life applications of the self-reconfigurable modular robots.*

Keywords: *self-reconfigurable, modular, robot, daily life, application, building, road, freight*

INTRODUCTION

Self-reconfigurable modular robots are multifunctional machines, which are able to perform a wide variety of tasks [1, 2]. In addition, they are able to self-repair and adapt to unanticipated conditions.

In recent years, many modular robots were created [3]. Despite that variety, their application in various spheres of daily life is still too modest. Scientists are still trying to find suitable areas for their application [4].

The current paper tries to fill that gap and presents different applications of modular robots in daily life.

SELF-RECONFIGURABLE ROBOT AND THE BUILDINGS

Because the self-reconfigurable robots have ability to reconfigure their modules [5], they can be used in buildings in several different ways, discussed below. Most likely, a modular robot building will be heterogeneous [3] and will contain of several modules. For example: module for the basic structure, module for the walls, module for windows and doors, module for power grid and other grids like telecommunication, piping, etc.

1. Constructing a building

Because the modular robots easily can form different 3D structures [5], the most basic thing they can do is to build different structures – from small premises like barracks to large buildings. This way of building process can be very efficient, because with manufacturing one single block, or several different blocks, buildings with different sizes, shapes and rooms can be build.

The ability of rearrangement the modules give the buildings some very interesting characteristics. For example, a modular robot building can:

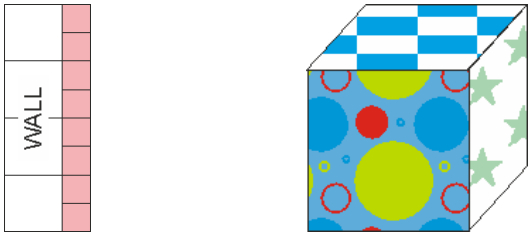
- Change its architecture – the number of its rooms, the size of its rooms, the position of its windows and doors, etc.;
- Change its location – practically, the building can disassemble itself, move by its own and assemble itself again on another location. If blocks have enough energy, or they power themself by a green energy, the building can move itself on any location on the world (For example, a programmer can give an order to the building, to move to a thousand kilometers and after some time the building will be on its new position);
- Maintain by its own – while the building has access to spare modules, it can maintain its good condition. For example, if some part of the building has a

defective module, the building can restrict the access to some of its parts and premises, and then can perform a module replacement or reconstruction.

2. Decorating a building

Modular robots can be used to decorate the inside of the building. Fig 1.a shows a building wall, which consist of two types of modules. First module type is used to actually build the wall and the second module type is smaller and is used to give the wall a specific decoration. This smaller module, shown on Fig. 1.b., can have different printings.

Some decorating modules can have printings on only one side, while another can have different printings on all of its sides. This way, by rotating a single module and showing different face to the room inside, great variety of colors and shapes can be achieved.



a) *b)*

Fig.1. Decorating wall with modular robots. a) Decorating modules are attached to a wall, built by other modules; b) decoration module, with printings on all of its sides.

SELF-RECONFIGURABLE ROBOT AND ROADS

It is possible for the module robots to be bound in a way, so they can form roads (Fig. 2). The advantages of such roads are:

- The road can build itself;
- After the road is build, part of it can easily be disassembled and assembled again. That way is some part of the road is no longer needed, it can be removed and modules can be used to build new roads.
- The road can maintain by its own – if some module is broken, the road can easily replace the module by itself.

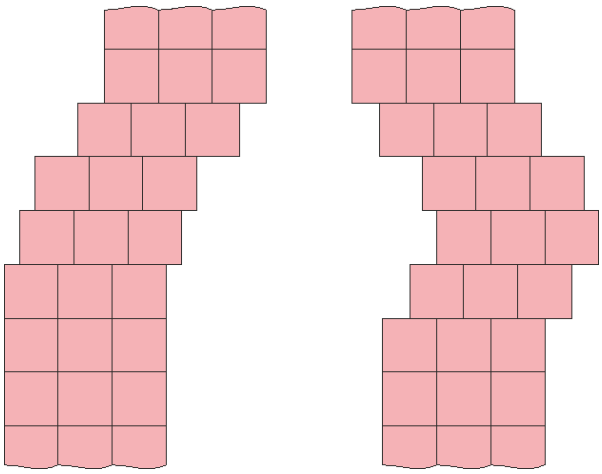


Fig.2. Modular robot forming roads.

- Every module can pass electrical signals to the next module. That way the road can have lighting;
- If the modules have flat sides, then vehicle with tires can travel on the road. If the modules have rails, then the road becomes a railroad.

SELF-RECONFIGURABLE ROBOT AND FREIGHTS

Except forming different structures and traveling through rough terrain [1, 2], modular robots can be also used for transportation of goods. This can be achieved by several different ways:

- Passing the goods (load) from one module to another;
- By usage of special modules, which are built to hold goods. Once the goods are in the specialized module, then this module can travel the entire modular robot body, to reach its destination.
- By formation of small autonomous robots, which can take the goods and transport them to specific location.

Fig. 3 shows one example of goods transportation in a modular robot building. Some of the building modules form a platform, where the goods are placed. Then by rearranging the modules, the load can be lifted up to the first, or to the second floor.

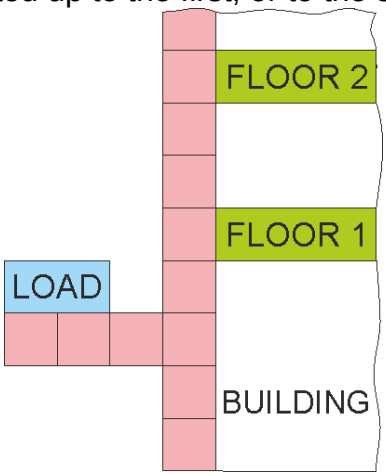


Fig.3. Modular robot forming an elevator.

DISCUSION AND CONCLUSION

This paper presents and discusses some daily life application of the self-reconfigurable modular robot. Of course, this paper does not exhaust all possible robot usages.

Since the modular robots still have not entered into our lives, it cannot be said in what areas they might be applied. That is why, with the advent of modular robots in the everyday life more possible usages will be revealed.

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ПРИЛОЖЕНИЯ НА МОДУЛНИТЕ САМОКОНФГУРИРАЩИ СЕ РОБОТИ В ЕЖЕДНЕВИЕТО

Методи Димитров

Русенски университет „Ангел Кънчев"

Резюме: *Използването на роботите и по специално на модулните самоконфигуриращи се роботи е все още много рядко. Текущата статия се фокусира върху някои приложения на самоконфигуриращи се роботи в ежедневието.*

Ключови думи: *самоконфигуриращ, модулен, робот, ежедневно, приложение, сгради, пътища, товари*

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