

**DEVELOPMENT MODEL OF HOUSEHOLD ROBOT**

*Considered of household robot - assistant that can be used at home to grab and move things that should make life easier for people with disabilities of the musculoskeletal system.*

*Keywords: work, life, management system model.*

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**РОЗРОБКА МОДЕЛІ РОБОТА – ПОМІЧНИКА**

*Розглядається побутовий робот – помічник, що може використовуватися в побуті для захоплення та переміщення речей, що має полегшити життя людям з вадами опорно-рухового апарату.*

*Ключові слова: робот, побут, система управління, модель.*

Mobile robots are utilized widely enough in the household. They allow taking objects on principle of human hand with their subsequent maintenance or transfer. A robot is an automatic device, which has a manipulator – mechanical analogue of human hand, and manipulator control system. These parts can have a different construction – from very simple to extraordinarily difficult. A manipulator usually consists of the joint united links, as a hand of man consists of bones, and finished with a grab which is something like a human hand raceme [1,2].

The manipulator of robot after the functional setting must provide motion of initial link with object. The manipulator allows motion of object with required trajectory in space with required orientation. For meeting this requirement, the basic mechanism of manipulator must have not less than six degrees of liberty and motion on each of them must be guided. A robot with six degrees of liberty is the difficult automatic system in realization. These types of systems are difficult both in making and in exploitation. Therefore in the real constructions of robots mechanisms are often utilized schematics with the number of liberties less than six. The simplest manipulators have three, rarer two, degrees of liberty. Such manipulators are considerably cheaper in production and exploitation, but pull out specific requirements to organization of working environment. [2,3]

As a result, there is a necessity of development of simple robot-helper for implementation of simple actions. The model of manipulator is made based on analysis of existent constructions of domestic robots and projected by the program SolidWorks (fig. 1).

Moving of manipulator links provided with so-called servomotors (servo) – analogue of muscles in the hand of man. Usually like such servos used system, which include for itself: reducing gear (system of gearings for the decline number of electric motor turns and for the increase of circulating moment) and electric parts to regulate tension and speed of rotation.

Our primary task is an analytical decision of forward and reverse problem of kinematics in a suitable kind for algorithmic description and writing of control program. Execution of such programs required at real-time. Execution of control movements must be in intervals between receiving information about an object from a video camera.

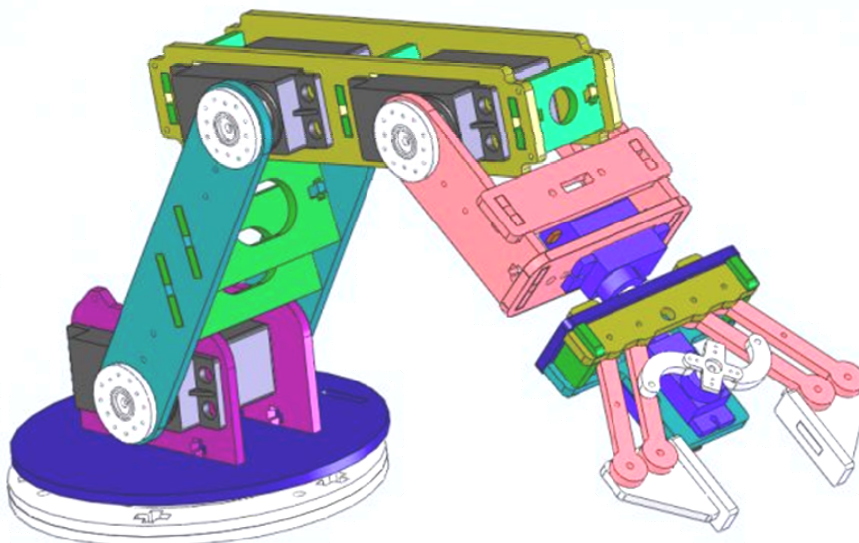


Fig. 1. Model of domestic robot – helper

In article presented three links mechanism. Links 1-3 connected between itself with the help of circulating motion 4-6 (fig. 2).

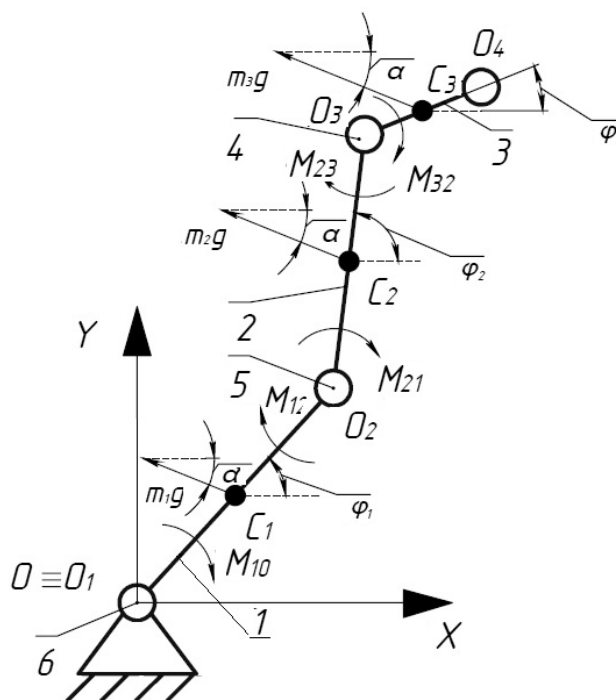


Fig. 2. Calculation chart three link of mechanism

Positions of links in space are determined with the corners of  $\varphi_1, \varphi_2, \varphi_3$ . In direction from outside to link exist moment  $M_{10}$ . In direction from the side of link 1 on a link 2 operates the moment of  $M_{12}$ . From the side of link 2 on a link 1 operates moment  $M_{21}$ , From link 2 to link 3 operates moment  $M_{23}$ . From link 3 into direction of link 2 exist mement  $M_{32}$ .

Force of gravitation exist at the same time and operates with the some angle  $\alpha$  to the chosen system of coordinates.

The basic task of design is determination law of motion and it limitations of selected mechanism with three active hinges ( $O_1, O_2, O_3$ ) to manage co-operations between  $M_{i, i-1}$ . We must determinate dependences in changes of links corners, angle speeds, accelerations of points of  $C_i$  in time).

Dependences of managing moments in time of experiment were experimentally founded (fig. 3).

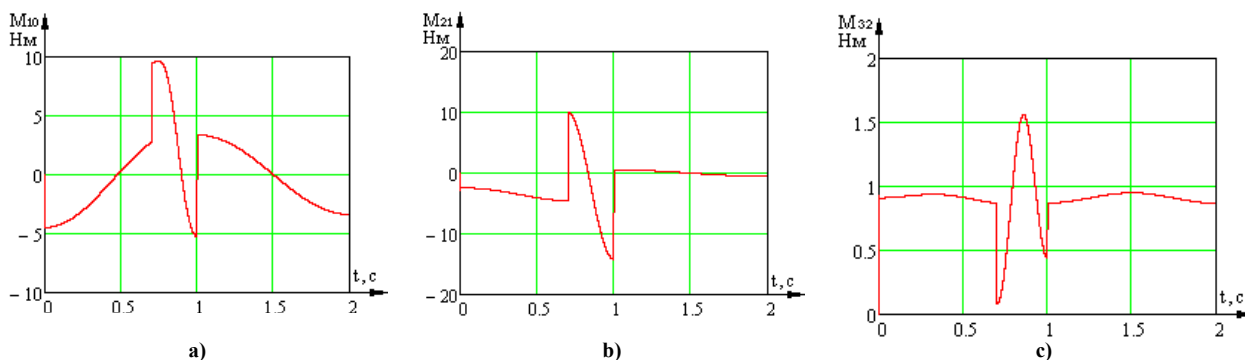


Fig. 3. Changes in moments of links in a time:

a) characteristics of moment  $M_{10}$  in link 1; b) characteristics of rotation moment  $M_{12}$  of link 2; c) characteristics of moment changes  $M_{32}$  in link 3

We received the diagrams of changes of the following values: angles, angle speeds, accelerations in links of mechanism (fig.4).

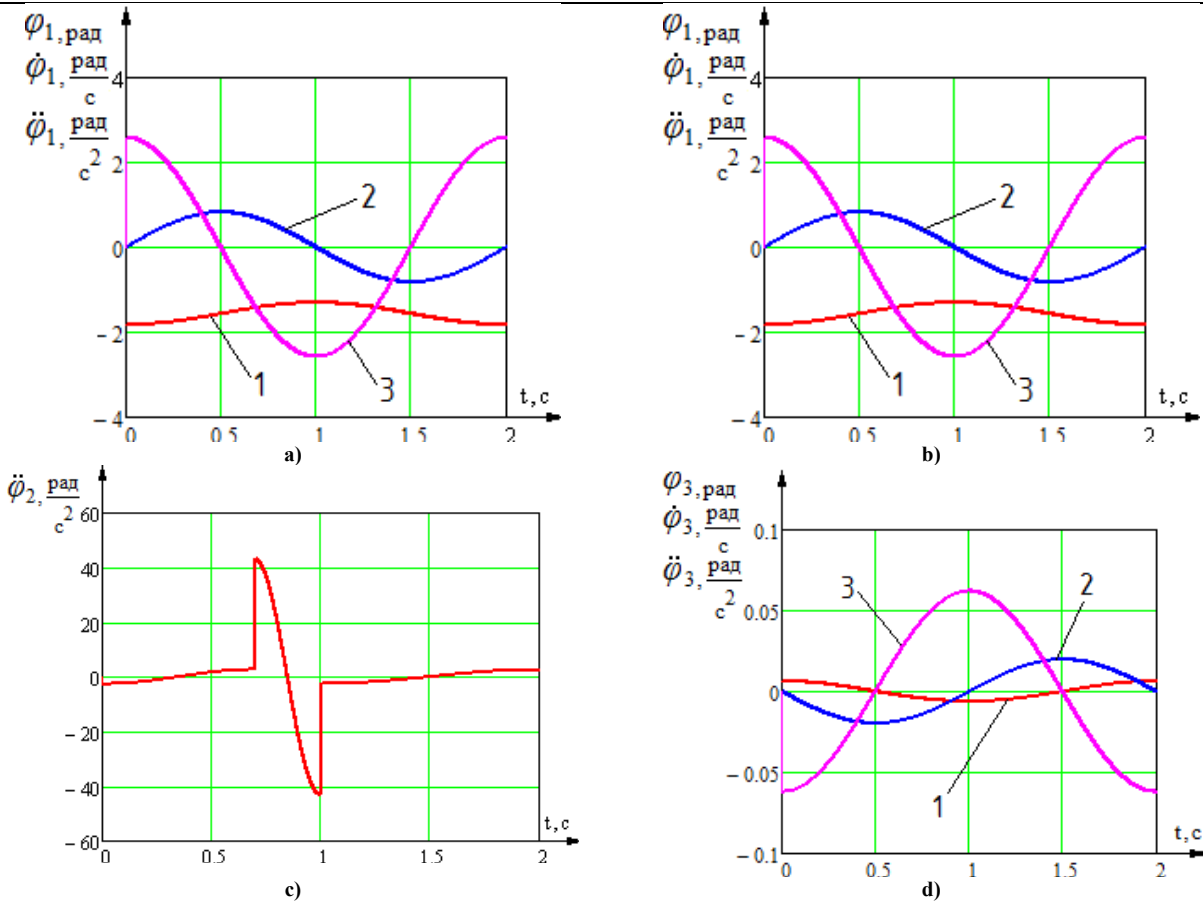


Fig. 4. Changes of angles, angle speed and acceleration of mechanism links: 1 – rotation angle; 2 – angle speed; 3 – acceleration of link. a) characteristics of angle, angle speed and acceleration of link 1; b) characteristics of angle, angle speed of link 2; c) characteristics of angle, acceleration of link 2; d) characteristics of angle, angle speed and acceleration of link 3

**Conclusion**

By using development environment SolidWorks we had developed and projected model of household robot. IDE SolidWorks helped to analyze of existing constructions. This allows us to investigate model to describe links of mechanism and connections between each links. This model allows seeing basic characteristics of mechanism, which is able to execute simple operations on to grab and moving of objects.

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