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DESIGN OF THE TELEOPERATION ALGORITHM TO CONTROL THE HUMANOID ROBOT

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Abstract – This paper presents a concept design of work algorithm for teleoperation control system of humanoid robot. Humanoid robot control system needs to stabilize the robot in a vertical position in order to prevent the robot from falling. The process of design of the control system includes the design of position filter to detect the unstable positions. The application of such a control system enables to control the humanoid robot using motion capture technology.

Algorithm of the control system work

Humanoid robots are actively developed last years. There are many different designs of humanoid robot constructions but not all of them have control system that realizes adequate behavior of humanoid robot. That is why we propose to use the teleoperation [1], [2], [3], [4] to control such type of the robots. Further, we consider the algorithm of the teleoperation control system that allow control humanoid robots using the RGB-D sensor.

To form the control signals we need to collect the data about the human position. Let us create the operational block that process the data received from the RGB-D sensor. The objectives of this block are the forming of the packets with the human operator data and the initial data filtering, for example, forming of the packets only with the recognized position of the operator. When packet is filtered, system must inform the operator about it.

To control the position of the humanoid robot we need to set the positions of the actuators that are located in the joints of the robot. The positions of the actuators can be mapped from the angles of rotations in the joint of the human operator. It means that we need to receive the control signals that contains the information about angles of rotations.

The human body differs from the robot body because the mass of their limbs is different and it can be a reason of the robot falling that is why it is necessary to ensure the stable vertical position of the robot through the control process to prevent his falling. Thus, we need to filter unstable positions of the robot [5]. Only after all of these operations mapped and filtered positions of actuators can be sended to the robot.

Thus, we have an algorithm that can be showed as a row of actions:

- collecting filtered data,
- synthesising of actuators positions according to the data,
- filtering of actuators positions that make robot unstable,
- sending of actuators positions to the robot.

Conclusion

In this paper, we have described the concept design of the teleoperation system of humanoid robot. The designed control system allow the operator to control the robot using the motion capture technology that is the most ergonomic way of the humanoid control [6]. The system includes the stability control that filter all unstable positions of the robot. Whole system let us to control the humanoid robot effectively through the process of the movement. This paper describes only the concept of the control system and the further work is the implementation of this concept in a real control system of humanoid robot. At this moment, we realized the basics of the forming of the control signals (fig. 1) and started to realize the stability filter in the control system of the robot BIOLOID.

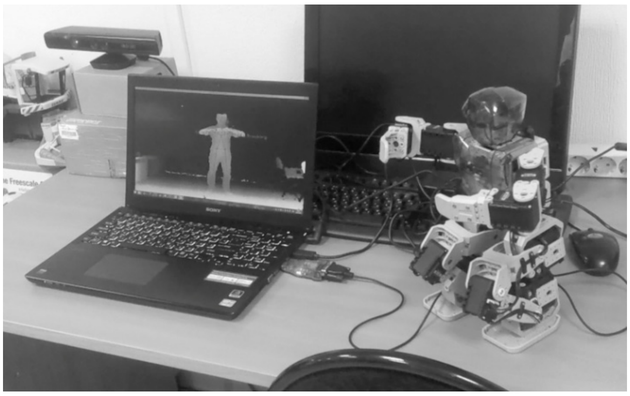

Fig. 1. First experiment on the control

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THE NEED OF REGULARIZATION FOR THE SYNTHESIS OF MULTI-LOOP CONTROL SYSTEMS

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Keywords: Multi loop control system, electric drive, regulator, real interpolation method, regularization.

Abstract – The article deals with the problem of the synthesis of multi loop control system. There is presented the substantiation of the need to using the regularization for solution the problem of the synthesis of multi-loop control systems. In addition, the base of the method of regularization represented there.

Introduction

The main questions of theory and practice of the Automatic Control Theory are related with the synthesis of the compensation, which system provides desired properties. The problem has completely solution for single-loop control systems.