One Method of Using the Technological Devices in Training Process

Edgar Harutyunyan

Yerevan Telecommunication
Research Institute Yerevan,
Republic of Armenia
Edgar.hyan@gmail.com

Gayane Demirchyan,

Yerevan Telecommunication
Research Institute, Yerevan,
Republic of Armenia
gayane-demirchyan@mail.ru

Monika Hambardzumyan

Yerevan Telecommunication
Research Institute, Yerevan,
Republic of Armenia
monika.hambardzumyan@mail.ru

ABSTRACT

In this article, the role of using new technological devices in education process is discussed. Here a teaching method is presented that allows to organize distance learning, applying the latest technology in programming learning sphere. The advantage of this method is that students have the opportunity to directly see the result, which increases their commitment to learning.

The example is presented on the puppets stand in order to create the virtual software systems. They allow to perform various movements and actions that contribute to the educational process.

Keywords

Puppets, control system, distance learning, block programming, automatic control systems

1. INTRODUCTION

As a rule, various motors are used to control different types of objects, especially servo type. It's also very popular in robotics.

Thus, having the group of motors and being able to organize their joint operation will enable us to build different control systems.

The model built from this group will make possible to organize distance learning of several professions both bachelor and technicians' educational levels, giving them the opportunity to build their own control systems that provide different movements.

2. THE MODEL OF PUPPET AND ITS APLICATION

The mechanism based on different types of servo motors is proposed for puppets management in Fig.1a. The mechanism of mechanical structure is given on in Fig. 1b.

The operating system consists of control unit, control mechanism, and the hanged on it puppet is given in Fig.1b. Puppet is hanging on the mechanism by threads.

The functional model of the electromechanical system is shown in Figure 3. The control by computer of the system is carried out:
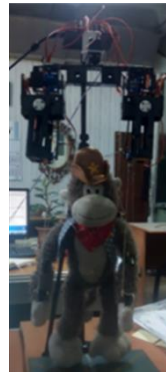
1a. 3D view of model for control puppets management
1b. The puppet hanged on mechanism.
Fig. 1

Figure 2 shows a kinematic scheme of the mechanism according to which puppet body rotation is carried out by joint 1, wings rotation in the horizontal plane by joints 2, controlling of wings rise and lower movements by joints 3 , joints 4 are used for puppet shank parts moving in the horizontal plane and joints 5 for the elbow parts moving vertically.

As seen from Figure 3 the electrical part of the system consists of electric servomotors, engine control unit, which is connected with the coupling intermediate block of computer via USB port.
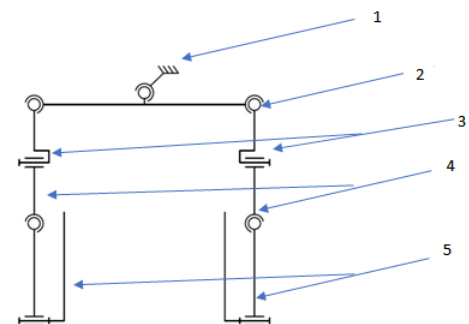

Fig. 2. The kinematic scheme of mechanism

The intermediate block serves as a memory of the computer where the program is recorded, and which enables continuously to transfer it to the control block of the motor independent of the computer.
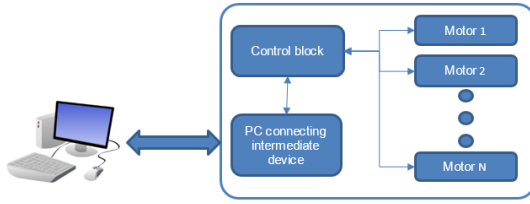
Fig.3. Functional model of electro mechanical system

This program can be used for two purposes:
1. educational purpose
2. demonstration (advertisement) purpose

Trainings are carried out by two methods:

1. direct
2. none direct (by plays)

3. TRAINING ORGANIZATION

The direct trainings are carried out as:
Special subprograms have been created that are designed to select the engine, organize its rotation, speed and angle of rotation. These subprograms enable to create similar systems and be able to remotely manage it, which will assist to the educational process. The student should be able to write a program using the given subprograms to perform either management task.

Subprograms are divided into four groups:
- Connection with puppet
- Data exchange
- File reading and registration,
- Disconnection.

Subprograms for connection with puppet
➤ boolean connectViaSocket(String ip, int port)-is connected with puppet via Socket:

➤ boolean connectViaCOM(String portName)-is connected with puppet via COM:

Disconnection`
➤ boolean disconnectSocket()- disconnects connection via Socket:

➤ boolean disconnectCOM()- disconnects connection via COM:

Data exchange
➤ boolean sendCommandsViaSocket(ArrayList<int[]>args)- sends commands via Socket:

➤ boolean sendCommandsViaCOM(ArrayList<int[]> args)- sends commands via COM:

Read and registration from files ArrayList<int[]> readCommandsFromFile(String path, String delimiterInLine)- reads commands from file.

➤ void writeCommandsToFile(String path, String delimiterInLine, ArrayList<int[]> commands, boolean append)- writes commands to file.

➤

➤ ArrayList<Motor> deserializeMotorsFromFile(String path)-reads motors' objects from file.

➤ boolean serializeMotorsToFile(String path, ArrayList<Motor> objs)- writes motors' objects to the file.

For this purpose, laboratory activities were also developed to teach students / pupils programming. The laboratory activities were designed so that everyone could learn programming, including both basic and more difficult problems. There are also laboratory works concerning puppets, carrying out of which students/pupils will be able to see different movements.

Developed a training manual for the study of language Java using puppets [1].

None direct (by plays) training is carried out by the following method:
Graphic interface has been created.

The interface of graphic images consist of:

1. controlling of puppet stand by buttons
2. Virtual Laboratory Segment

The software for WEB environment and Android operating system is developed, which allows managing by education stand remotely.

The software interface includes buttons, each of which provides some functionality. The movements, which should carry out the educational stand-puppet is seen in interface.

The movements can be seen both in virtual environments and on the stand.

The program includes a segment of the virtual laboratory work that allows pupils or students to test their programming skills.

For this purpose, in the program there is a separate section in which the user will be able to learn general concepts and then be able to perform tasks, as a result the user will see as both the virtual environment and on the stand.

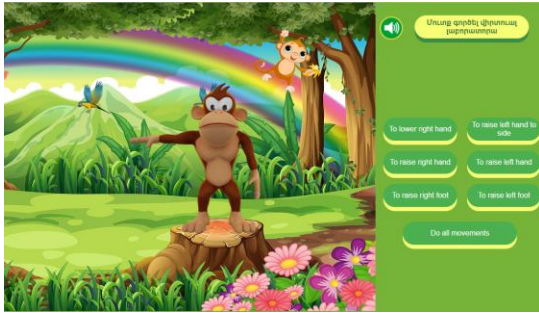The graphic interface of WEB environment program is shown in Fig. 4(a, b).

Fig. 4a. Interface for application

Fig. 4b. Interface for application

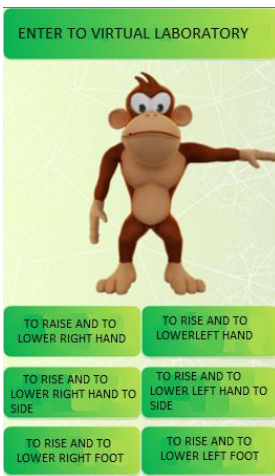The graphic interface of Android program is shown in Fig. 5(a, b).
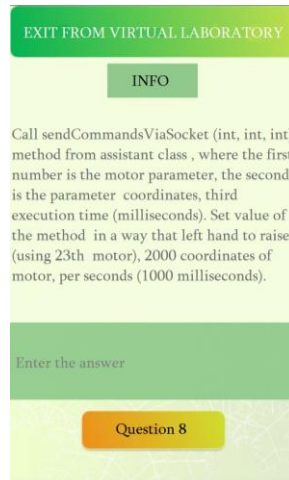

Fig. 5a. Front desk of graphic interface

Fig. 5b. Front desk of graphic interface

The two types of interfaces have created for remote control and presentation:
1. tabular management interface
2. graphic images interface

The interface of tabular management is shown in Figure 6, where the control panel is divided into 3 parts:
- Servo motors control block (Figure 6a)
- Operation block with files database (Figure 6b)
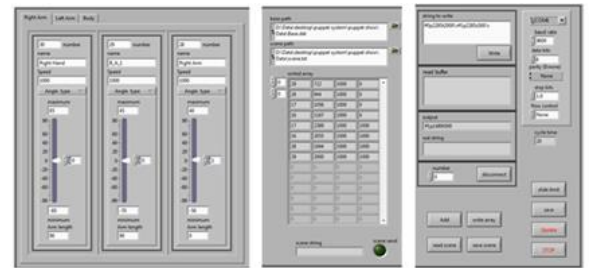- Communication and diagnostic blocks (Figure 6c):

a   b   c

Fig. 6. Front desk of graphic interface.

The interface of graphic images method is shown in Figures 4, 5. More details вhown at the top.

5. CONCLUSION

The proposed system is convenient for teaching subjects such as automatic control systems and programming languages.

In addition, when organizing practical classes, students can carry out projects on the development of controlled programs themselves, with writing specific engine drivers.

Here, the learning tasks for organizing networks of embedded systems can be solved.

6. ACKNOWLEDGEMENT

REFERENCES

1. Modern Java EE Design Patterns by Markus Eisele Copyright © 2016 O'Reilly Media. All rights reserved. Printed in the United States of America. Published by O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.