

# GRAPHICAL USER INTERFACE FOR THE FAMILY OF EDUCATIONAL ROBOTS “ROBKO”

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**Abstract:** The purpose of this paper is to present a Graphical User Interface for easy control of all types of the Family of Educational Robots “ROBKO”, allowing for both manual (by keyboard commands) as well as automated (by execution of automated control scripts) user control and configuration. Using of such Graphical User Interface allowing our educational robots to be a good tool for educating students, young specialist and researchers in many different fields like mechanics, electronic hardware, software, artificial intelligences, sensor and sensory systems.

**Keywords:** Graphical User Interface, Educational Robots, ROBKO 01 Articulated Robot, Robot Arm, Sensors and Sensory Systems

## 1. Introduction

The Graphical User Interface (GUI) is provided as a means of easy configuration and control of the Robot Arm through a PC serial port. It allows for manual as well as automated robot control and configuration of some important parameters.

Using CAD software program SOLIDWORKS [1] we have made a simplified 3D model of our six degree of freedom Articulated Educational Robot ROBKO 01 [2] (see Fig. 1).

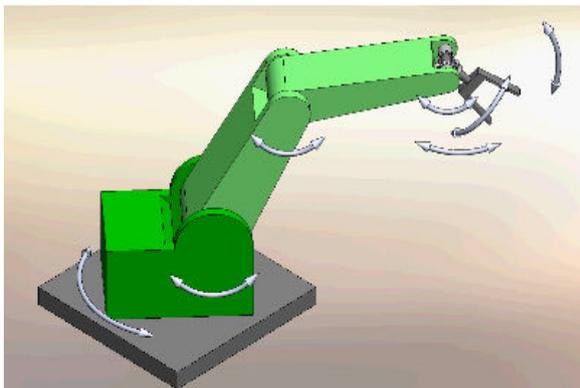


Fig. 1 Simplified 3D Model of ROBKO 01

## 2. Graphical User Interface Overview

The interaction between an operator and the Robot Arm is implemented by software on the host PC.

The software is developed using Visual Studio Express [3] and has a main menu, a toolbar and user area [4], containing a background image, presenting a simplified picture of a robot-arm and capable of accepting keyboard commands for manual control of the robot (see Fig.2).

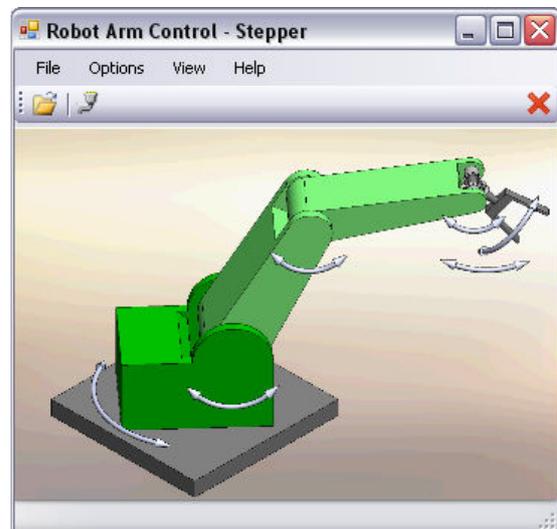


Fig. 2 Main Menu

### 3 Graphical User Interface Main Menu

Main menu of our Graphical User Interface consists of the following features:

#### 3.1 File Menu

The File menu contains two options – Open and Exit (see Fig. 3).

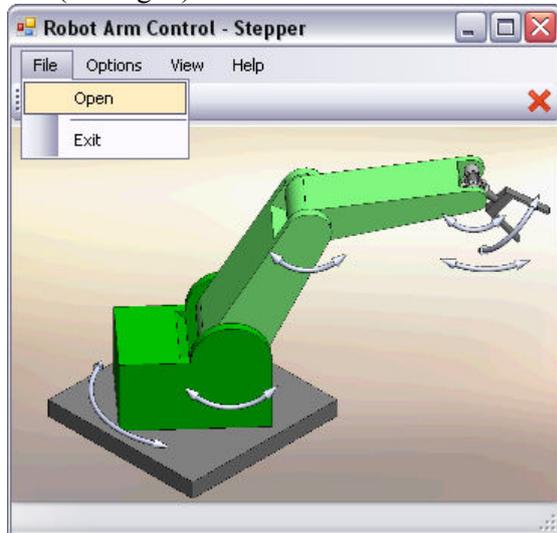


Fig. 3 File Menu

- **Open** option allows for execution of automated control scripts – text files, containing commands (as described in CLI section), as well as comment lines, beginning with // (double slash). Each command or comment takes 1 line
- **Exit** closes the program

#### 3.2 Options Menu

The Options menu contains two options – COM Select and Joints (see Fig.4)

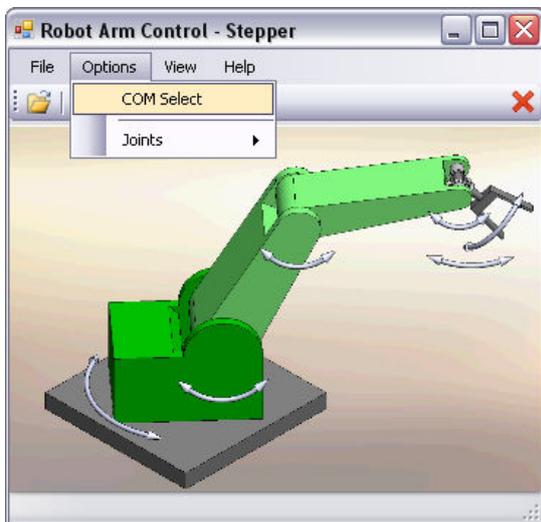


Fig. 4 Options Menu

- **COM Select** option opens a dialog box where the name of COM port used for communication with Robot is used (see Fig. 5)

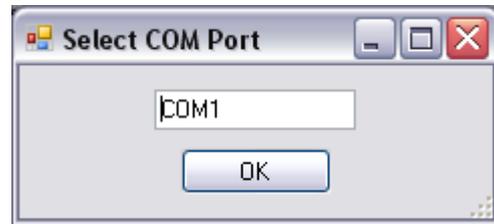


Fig. 5 COM Select Option

The user can enter a new COM port and press OK, or cancel (closing with X button);

- **Joints** option is a submenu that allows for configuration of parameters of Robots' joints (see Fig.6).



Fig.6 Joints Options

When the program is started first, it detects the current robot's configuration i.e. the number of joints (it may be 1 more than actual joints number because some of robot's internal modules are capable of controlling 2 joints simultaneously).

When a Joint option is clicked, the following configuration dialog appears (see Fig. 7).

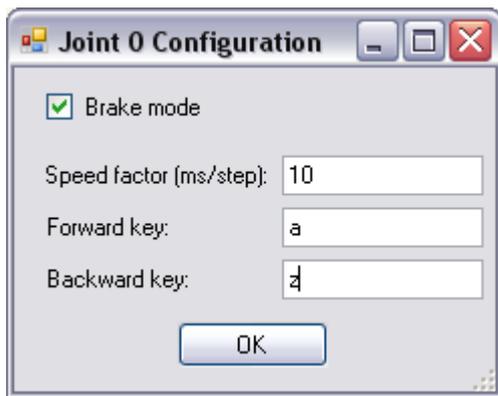


Fig. 7 Joint Configuration

There is a checkbox that can configure the corresponding joint's *Stop Mode* [5]. When checked, the *Stop Mode* becomes "Brake stop", and when cleared – "Release stop". Once set, each *Stop Mode* is affecting the execution of a script opened with **File-Open** option, up to a point where the script changes it explicitly. The manual stop (using SP key) is also affected. In short, each joint remembers its last *Stop Mode* until changed explicitly or powered down. Also there is a setting for Speed Factor of the selected Joint (the delay between steps, milliseconds) and the two keys for manually controlling the joint forward/backwards. (SP key performs STOP on all joints).

### 3.3 View and Help Menus

- ◇ View menu contains options for changing Robot's image appearance in the main program's window.
- ◇ Help item contains instructions of how to operate with the software.

### 3.4 Toolbar.

On the toolbar there are several buttons that access important functions:

**Open** – a button with picture of an open folder, corresponds to the File | Open menu option;

**COM select** – a button with standard "PC serial/parallel port" picture, corresponds to Options | COM Select menu option;

**Stop** – a red X button for stopping execution of a started script (see File | Open menu option description).

### 3.5 User area

The user area is a simplified picture of a robot arm. It can accept keyboard commands (one symbol each) that implement manual control of the robot. The SP (Space) key stops all movement; each joint is stopped in its current *Stop Mode* [6].

## 4. Conclusion

Robotics is a multidisciplinary scientific field which includes mechanics, electronic hardware, software, artificial intelligences, sensor and sensory systems and our educational robots are good tool for educating students, young specialists and researchers in all this fields, since the developed from us Graphical User Interface for the Family of Educational Robots "ROBKO" allows easy control for both manual (by keyboard commands) and automated (by execution of automated control scripts) modes.

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