

School projects of robotics

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Abstract – We encourage students to attend robotics classes with carrying out some simple projects already in the primary school. Projects are based on the computer controlled models of useful, everyday things. The elaboration is conducted 'from an idea to the product'. Through the project students get to know how different technologies operate, they learn about the working and the usage of the interfaces and they start programming.

In the paper we are going to present three projects which are carried out together with students – the model of an alarm device, the model of windscreen wipers and the model of assembly line which separates inadequate items from adequate ones. All models are controlled through the interface eProDas-Rob1 using the programme VisualBasic

Keywords – Robotics, school projects, controlled models, eProDas-Rob1

1. INTRODUCTION

Students in Slovenia can get in touch with robotics already in the primary school. The primary school can offer two different optional subjects, Robotics in technology in the 8th grade (students aged 13 – 14) and Electronics with robotics in the 9th grade. However, in reality only a few schools offer an optional subject connected with robotics, as the schools are not well-equipped in this field and the commercial offer of the robotics equipment is rather expensive. Professional education and training for the teachers in this field was very poor before the beginning of the project ComLab. The equipment developed in the projects ComLab and good education of its use encouraged a great numbers of teachers to offer their students the optional subject Robotics in technology. This article presents three projects, carried out together with students during the lessons of this subject.

2. OPTIONAL SUBJECT ROBOTICS IN TECHNOLOGY

Robotics in technology is a technical optional subject in the primary school. It lasts for one year and is attended by 8th grade students. Students undertake a range of practical basics of robotics, the importance and the role of robotics in everyday life (production). Lessons are practical and students come to their conclusions gradually, through project work. Projects are based on the computer controlled models of useful, everyday things. Through the projects, students start to understand how different technologies operate, they learn about how interfaces work and about their usage, they also begin to write basic programmes. [1]

The project ComLab has offered the teachers low-cost, universal equipment with the software manuals included for use within schools for different (also free of charge) software. At our school we use interfaces H-bridge and eProDas-Rob1, free version of the programme VisualBasic and parts of the 'Fischer Technik' kit. The school bought several sets of Fischer Technik (UT-1, UT-2, UT-3 and UT-4) to be used at the lessons of craft.

3. INTERFACE eProDas-Rob1

The interface eProDas-Rob1 is a very useful control which could be connected to a computer or wireless. The interface eProDas-Rob1 is designed so that the computer programme can be transferred directly to the interface, then the interface is disconnected and works on its own (only if programmed with BASCOM). With the interface various electric devices such as motors, lights, LCD screens can be controlled, or we can receive useful data, such as voltage, lighting and temperature. [2]

In our projects, we used digital outputs, digital inputs and buttons on the interface. The interface was connected to the computer via LPT connector, and we use the programme VisualBasic which requires a constant communication with the computer. The electrical supply voltage of the interface is between 7.5 V and 12 V.

The framework of the ComLab manual includes interface programming libraries, both for BASCOM and for VisualBasic. This is the so-called HEX file where all the functions and procedures necessary for interface programming are written down. Students can easily learn the appropriate commands for modelling digital outputs and buttons on the interface as well as commands for reading the outcome on the inputs. Once they know some basic programming in VisualBasic they are ready to work on the projects. [2]

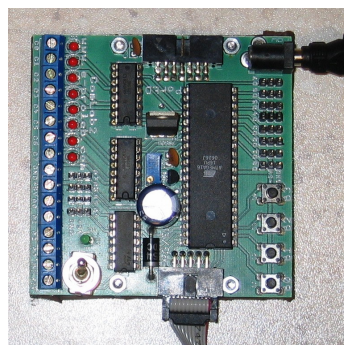


Fig. 1. Interface e-ProDas-Rob1.

4. SCHOOL PROJECTS

4.1 Choice of projects

We should choose projects which give the students good knowledge about the construction and function of various devices. Projects should not be too difficult as the primary school students do not have sufficient knowledge about the technology and robotics. There are only 35 lessons available for this subject, so we try to choose the projects that can be carried out in a few lessons. If the projects are too difficult the students lose their motivation and enthusiasm. Our task is to lead the students through the project, giving them technical assistance and motivating them.

Through the projects described below, students get to know how the light alarm device, the windscreen wipers and the assembly line (which separates inadequate items from adequate ones) work. In each of the projects students first have to plan the construction of the model (the parts of Fischer Technik kit). They find out which electrical items should be connected to the interface so that the model can be controlled. When the model is constructed and connected to the interface, they start programming (VisualBasic). With the suitable programme they get the final product – a working model.

4.2 The alarm device

The model of the alarm device is a simple project where students get to know the basics of control by using the interface eProDas-Rob1. They realise that they need a sensor which will detect the change of status and a warning device which would signal the release of alarm (light). The flashing light sensor is connected to the digital input, and the lights to the digital output on the interface. Students then use the programme VisualBasic to construct the button used to switch on the model and write down the loop which checks the status of the digital input. When the status of the input is changed, the programme notifies the interface to switch on the digital outputs. The programme also includes a command which enables the switch-off of the alarm device by using the button on the interface. [3]

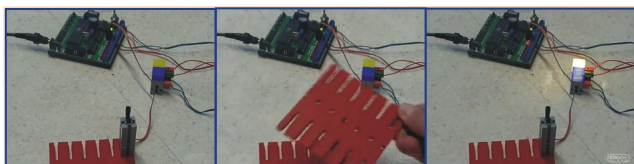


Fig. 2. Triggering the alarm device.

4.3 The windscreen wipers

The model of windscreen wipers requires more programming and some knowledge of driving gears (circular motion is changed into rectilinear motion – oscillation). A DC motor is used for the model drive, and the switch ensures we stop the model in the appropriate position. The model of windscreen wipers is carried out in

two ways. Firstly the model is controlled with the buttons on the interface. Functions are allocated to three buttons (switch-on, working in intervals and switch-off). Secondly, the buttons are designed in the programme VisualBasic, so that the working is controlled by a computer mouse. The most difficult part of the project is to ensure the wipers stop in the initial position (like real wipers). When we press the ‘stop’ button, the status on the digital output (motor) changes and the signal is sent so the wipers move to the right position. [3]

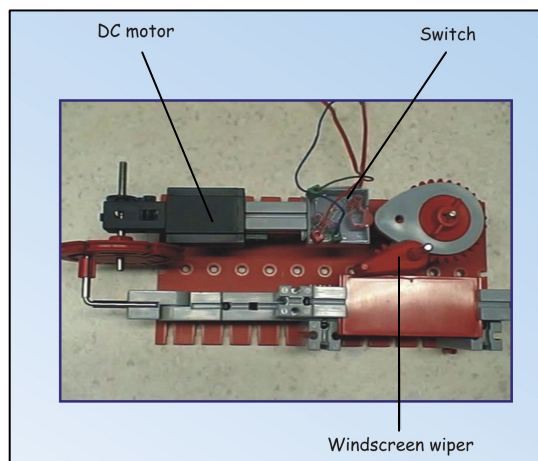


Fig. 3. The model of windscreen wipers.

4.4 The assembly line

The model of assembly line transports the items and with the lighting sensor checks their adequacy. When it detects an inadequate item, it releases the signal and separates inadequate items from the adequate ones. We need two motors: one for the conveyor belt drive and the other for the separating drive. A flashing light sensor is used to define whether the items are adequate or not. If an item is too dark, the sensor detects it and sends a signal to the motor to eliminate the inadequate item. We also need bulbs to warn us about what is happening on the conveyor belt. The conveyor belt is set into motion by pressing the button in VisualBasic and stopped by the button on the interface. [3]

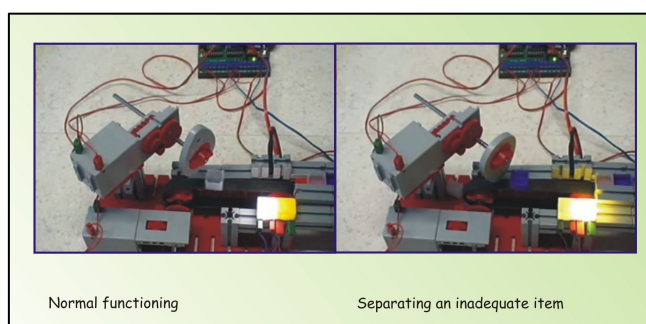


Fig. 4. The assembly line.

5. CONCLUSION

Very simple projects, yet they encourage students to participate in technique, robotics, computer science and electronics. Students get to know how to use the drivers, they find out how the interfaces work (the usage of digital inputs and outputs), they learn the basics of programming, develop logical thinking, ... Due to the easy access of the products of the project ComLab, more and more schools decide to offer the optional subject robotics to their students. Consequently, there are more and more materials on the internet. Students take part in competitions connected with robotics and become keen on science.

REFERENCES

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