something. So, the robot is capable to maintain a conversation or call relatives in case of emergency. Elderly people's eyesight often lets them down, so it is essential that the robot is programmed to read any books that the owner enjoys most of all.

The robot's most important component is its processor which receives and analyses the information about the robot's actions.

Now we would like to focus attention on one of the most significant parts of our invention which is the robot's arm allowing the robot to do massage of any complexity, prepare wholesome food for it owner, moreover, monitor the elderly person's health. To perform these functions well, a special sensory system is built in its arm which enables the robot to check a person's level of hormones in blood. You know, functioning of all organisms is determined by a hormonal level. If the owner feels weak or sad, the level of endorphins gets lowered. The robot is programmed to analyze the person's condition and take appropriate measures. For example, it can amuse its owner, talk to the owner, or in case of emergency get in touch with the owner's relatives.

We have said before that our robot is mobile. So we built in super-power vacuum cleaners in its body so that it can vacuum a house. This is regarded as an additional technical characteristic of our invention. Vacuuming the dust, the robot gets powered; therefore, its work does not demand additional electrical power. To say more, our robot is capable of dancing. To remind an elderly person of his or her youth, sometimes it is necessary to dance, so our robot will help them do it.

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Robotic model car: theory and practice of construction and application

The Freescale Cup is a well-known competition of autonomous models of cars. Model cars are independently tested for speed racing track, which has a form of a winding black line deposited on sheets of white plastic 60 cm wide. The track consists of various elements: slides, snakes, irregularities, tunnels, crossings and all kinds of turns. The team's goal is to collect an autonomous robot and program it to pass the competition. The winner is a model car which overcomes the track as fast as possible without descending from the track.

Each group of participants is provided with a free standard race kit which includes a set of chassis with motors and servo drive, battery, Freescale microcontroller TRK-MPC5604B development board, camera and power stage to

control a motor. The team's goal is to collect an autonomous robot and program it to pass the competition.

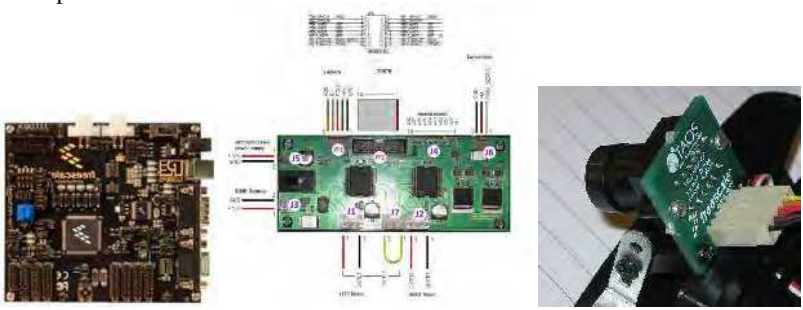

Figure 1. Parts of the car: chassis with extra parts, microcontroller, power stage board and camera

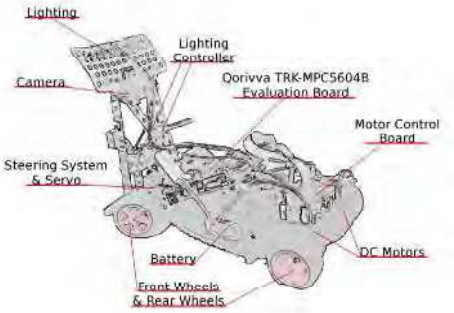

Figure 2. Main parts of the car

Mechanical design of our model car consists of microcontroller board, servo and steering system, DC Motors and motor control board.

To mount the motherboard and microcontroller, a sheet metal is used which can be easily cut and bent. In addition, sheet metal is used for mounting the LEDs thereon to provide both good illumination and illumination handling.

Camera and LED platform are installed in the structure to regulate the area in front of the car to capture the camera's sensor. After the camera is set up, we can catch a line where a car goes.

Servomotor is set to control a set of chassis. To ensure construction's reliability, batteries are linked to the chassis by two clamps. Microcontroller board is soldered to the board.

LED panel's current source power is regulated with a connecting wire. The switch is used to control LEDs power supply to save battery's power.

The total vehicle weight is 1288 ± 5g, which implies a rational balance of speed and weight.

Development board with MPC5604B microcontroller is a brain of autonomous car model. To design a model car we used: LEDs to signalize states of machine;

switches to create simple program interface; potentiometer to set velocity in debug mode; input/output pins congurated as pulse wide modulated signals for drive motors and servo motor control; input/output pins congurated as inputs of Analog/Digital Converter for data acquisition; fram potentiometer and camera sensor; input/output pins conjugated as outputs for control signals to H-bridges and camera.

Broad signal modulation with a period of 20ms is used in servo control that provides the functions of module MPC5604B microcontroller. LM358 provides the LEDs. Light platform transforms a control signal of 0 to 5 [V] to the current source is adjustable from 5 mA to 350 mA. Overvoltage protection LEDs and the possibility of increasing performance in energy consumption by LM318 helped to reduce power consumption to 390mA.

Potentiometer allows changing the light output. Volteg is perceived as ADC module and used to set any value, i.e. motors PWM duty, light drive control PWM duty, max speed value, etc.

It becomes possible to alter the direction of rotation of the motor output PB (16) pin with the help of the power stage on the circuit board and microcontroller. The direction of rotation of both motors depends on motor output PB (16) pin. This is required to stop the movement after the finish.

Speed of rotation is controlled by a signal at H-bridge. Camera sensor functions without being connected to the ground, which allows removing the interference of the data received

Infinite loop control provides autonomous control and starts the cycle with data from the ADC 128 pixels the camera's sensor. These data fix the position of the line and transfer the control signal to the closed-loop control with PD. On this basis, PWM outputs signals control the drive motors and servo motor. Control loop is implemented in interrupts caused by the system timer module microcontroller.

We put the timer ADC start to read the pixel values of the camera. After the pixels are read, 0 is set and 8 ms is awaited for a similar transformation.

Camera data is transmitted to the computer via UART and displayed in Matlab. This allows you to set the camera at the right angle to capture the best line.

Data visualization gives us information about the response of the sensor to the light, without adjusting the focus on the oscilloscope. It also allows you to control the position of the line algorithm and judge the servo. Position of the line is displayed in pixels to the sensor, which catches the midpoint of the track.

Algorithm alteration is regulated by certain coefficients: differential coefficient of the engine rotation, dependency ratio between the value of the PWM servo and the radius of curvature of the wheels, ratio of the frequency of the PWM servo controller information with PD and other multimode. The movement of cars avoiding obstacles is controlled by these coefficients.

Constant value of the motor control PWM is the lowest value at which the car moves forward and does not stop. STR coefficient is dependent on the maximum motor speed control signal PD to ensure speed on non-straight section.

All these algorithms work as a whole unit. All parts of the control loops are set after reading the data from the camera. Motor current is measured and used to

determine the value of the slope. In case the motor current increases greatly, the maximum speed is set for a short time to get out of slope quickly.

Control software was developed with the help of CodeWarrior IDE and RAppID applications customized for MPC5604 series microcontrollers.

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Designing a robot to advance fruit picking

Many scientists and teachers of English language refer project work to one of the most effective methods of teaching and learning a foreign language carried out through research and communication [1]. According to Olga Supe, “project work is a student-centred teaching approach, it motivates students to use language in real life situation, and it involves a great number of students’ feelings, talents, skills, and knowledge in learning process” [2].

The authors of this paper, the students of Tomsk Polytechnic University, totally share this opinion and aim to describe their experience in doing project work in English language classes. The topic for research was chosen to be as follows: designing a robot to advance fruit picking.

Fruit picking is one of the most delicate agricultural activities. Potato and grain harvesters were invented many years ago. Although we live in the twenty first century, the agricultural labour is still not mechanized or automated in most of the orchards. Previous attempts to create robots for fruit picking failed since they detected only one fruit, picked it up, then continued to look for another one without realizing whether all fruits were collected from one and the same tree. The process was very slow.

The aim of our work is to introduce a project developed by researchers of Vision Robotics Corporation, the USA [3]. The scientists made a lot of efforts to design a robot for increasing the speed, efficiency and quality of fruit picking. So the main points of to be covered within this article include: the robot’s structure, its power source, size and estimated cost of robot.