PROPOSAL OF ALGORITHMS FOR COOPERATION AMONG DEVICES IN APPLICATION WITH ROBOT

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Abstract

Mentioned application in this article was designed for exhibition purposes. It is about progress of algorithms proposals for game that plays through the dual-arm robot via mobile phone or tablet with Android. In application is connected camera and computer yet.

Key words: multi-devices application, dual-arm robot, algorithm, cooperation.

INTRODUCTION

The application itself looks like this: Robot serves cube (collects them and throws them), so that one does not at all interfere in the work area. You can select the game of man against the robot, or a game of man against man. Control shooting and action robot via a mobile phone or tablet with Bluetooth wireless communication. Camera system increases the intelligence of the entire application and is used for recognition thrown dice combinations and determining the score. Accordingly there has to be 3 software applications: software application in the computer, program for robot movements, program for Android device.

ALGORITHM OF THE GAME

It consists of two main branches throughout the game by players selected (1 or 2). It is always necessary that the Bluetooth module "Player 1" was paired device, because without this condition it is impossible to run the application. From the device "Player 1" user selects whether he wants to play against the robot or against another player. Consequently, the robot waits for the movements of the connected device (accelerometer and the sensor rotation), according to which the moving arm (stirred cubes). When simulating the movement of the dice, using a connected device, there is a roll of dice robot. Camera system reads the values of the dice thrown. The result is sent to the connected device via Bluetooth (if you connect two devices are on both). Then, the robot waits for the other player (if such option is selected games), or throwing dice alone. After evaluation of discarded values occur evaluation games, i.e. or was thrown higher value player 1 or player 2 (or robot). Algorithm is shown on the Figure 1.

INTERCONNECTION DEVICES

In this case was chosen interconnection as Figure 2.
When designing a table and effectors was necessary based on the fact that the selected system is unable to transmit position data and orientation dice on craps table to the control system of the robot. The solution was necessary to ensure the removal of dice gaming table robot anywhere on the table will contain the dice. Of course dice cannot leave the demarcated area of the console, which is secured by fencing the area. The left arm of the robot is used to carry out two movements to move the dice on a game table abstracted into position. Suitable position for taking dice in the bottom corner of the table because the proposed right-effector called “Right hand” of the robot.

ALGORITHM FOR THE COMPUTER APPLICATION

This application is viewed from all other connections as a major, because it manages the entire system and communicates with the mobile application and the control system of the robot. It consists of two main modules:
- The communication module,
- Module of image processing and evaluation throw.

Algorithm design in the computer (Fig.3) must communicate with the mobile application and the application moves the robot.

The communication is managed with the assistance of the results received from the module image processing and evaluation throw (fig.4). The results of this module are two numbers defining the values thrown on playing dice.

ALGORITHM FOR THE ROBOT APPLICATION

The software program of the robot is composed of two modules, which are related with the reaction of the robot inputs. As a result shall be made:
- Harvested from robots dice gaming table (Fig.5),
- Movements of dice in hand of the robot (mixing cubes in hand) followed by a roll of the table (Fig.6).

Both parts are quite simple and their execution is always gradual and synchronized with the associated inputs.
Devices must include Bluetooth interface and must also have an accelerometer and orientation sensor. The application is controlled by the user and without this application is not possible for the robot receives commands from the computer. It is the only system-wide interaction with the user.

The algorithm of mobile applications is on Figure 7. After starting there to control existing BT devices around the mobile device on which the application runs. Failing to verify the existence of two BT devices to the computer (BThrac1 and BThrac2), then the application shuts down. If the verification is successful, then the user selects one of the options. After selecting "BThrac1" has the option to choose a game against the robot or against another player.

If you chose the first option and its application sends a command to the computer to trigger grip cubes robot. He recovered after seizing application sends a message to terminate this operation. Consequently, the application copies the movement of the mobile device and accordingly sends commands to the computer to move the robot arm (mixing cubes). If the rotation device, which mimics the movement of the hand and dropped the rollover, then an application sends a command to rotate the robot arm and roll the dice. It waits until the application program on a computer not evaluated thrown numbers, which in turn receives and displays on the computer display. After successfully receiving information send feedback to the robot continued and subsequently collected the dice roll. Computer throw again evaluated and sends information to a mobile device. After receiving the information application compares both feast and evaluates the result.

If there is a choice of games with two players, and one player to throw occurs similarly as in the previous case. Subsequently, the computer will not play as a robot, but there is a similar pattern throw from the second mobile device (paired with BThrac2).

CONCLUSION

All software applications communicate with each other using an agreed communication and running is dependent on it. Adjust the overall application despite the simplicity of the said modules be rather difficult because of communication depending on the different phases of algorithms.

The resulting application is relatively stable, but in the form it has not yet recommended for completely autonomously without human control, because the proposed algorithms are unresolved critical statements and reports looping programs. In the future it would be appropriate to all critical phases of software modules treated.
most unstable is image processing, which has several critical points.

References


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