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Research Paper

RADAR AND WIRELESS COMMUNICATION BOMB DISPOSAL MILITARY ROBOT

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ABSTRACT **Remote robotic technologies is a project deeply researched aiming at the help of bomb teams disarm explosives without the need of human contact to keep experts safe. A small robotic hand with a data glove, were designed to get input order to mimic human gestures such as pulling wires[1]. The Robot is important, because it serves the needs of the bomb squad and radioactive materials personnel. Engineering Robotics is limited in an area of combined different fields including mechanical, communication and electrical engineering which make up the field of Mechatronics from which Robotics emerge. [2] Robotics is not a fresh new field, great research has been done by others, like the scientist like the famous science writer Isaac Asimov has given it new term known by the "science robot" [3]. However, our research is not merely a Science robot, but it is additional with our contribution in such a way that uses different tools of engineering communication. For example, radar systems, and laser defense.**

KEYWORDS :Radar, Wireless, Bomb Disposal, Military Robot.

INTRODUCTION

This module robot is made up of base and arm inputs and outputs to receive and send signals (radar and laser). It can be used for many purposes :

1. Handling hostage issues (helping police)
2. Developing missions (helping military)
3. Giving video feedback (In fire cases)
4. Handling radioactive materials (Chemical or material Bomb)

According to IEEE Robotics & Automation Magazine the problem statement:*" Robots are used in many cases to aid bomb squads, but they have many limitations. Current bomb disposal robots have grippers which allow the robot to open doors and access the explosive device; however, in most cases a human must put themselves in danger by disarming the device manually "*[4]. This question can be presented: how can receive inputs from the radar and transmit the required data to the laser controller? so the Problems of communication reliability inputs and outputs to receive and send signals (radar and laser) is still to be solved in our thesis**.**

Aims and objectives

In our master thesis we intend to target of designing the robot module is to give as much defense as possible to any bomb disposal team by maintaining their safety first by build a test an experiment .

The goals to achieve for such a robot are:

1. Providing a user friendly application to control a threatening bomb.
2. Using the robotic arm to control the packet.
3. Offering a video feedback from the packet site.
4. Using radar and laser systems.

Expected outcomes

Modules are analyzed on an approach functioned basis, upon its individual action.

The WBDR is designed to include both Software and Robotic architecture performances.

The software performance uses video interface module card to record, store and control the live feedback transmitted to the application from the robot. In addition, joystick interface is module to control actions of the robotic arm and its changes in movement. Moreover, Serial interface radar module is used to control all the micro synchronized data sent through the serial port. At last, An Application Control laser Module is used to control all the levels of inputs transmitted to the microcontroller as signals.

The Robotic architectural performance is designed with a rectangular metal rod ended Robotic Base, accompanied with WBDR Control user friendly Application which is a key based robotic movement and joystick based for arm movement.

Research Methodology

Engineering communication Problem

The robots are designed with grippers to open doors and enter the system of the explosive devices in order not to refer to human hands to do so.

Engineering communication Goal

The goal of the module is to create a hand attached to the robot to make it disarm the bomb without putting bomb specialists in danger to do the mission.

Methods and Procedures

The abilities of the bomb disposal can have a better performance with a hand attached to the robot and controlled by a worn glove. This hand not only makes the disposal less expensive but it increases the robot's ability by decreasing the hardships. The movements will be controlled by a tendon drive in the forearm. The hand will be designed to have two fingers and a thumb. The hand constitution will be made up of fishing line, aluminum, plastic tubs, and electronics. The hand's grasp will be individually tested as much as possible to maintain the strongest grasp possible.

Design

The hand is previously design according to a matrix to define the right under actuation. The result came out stating that the absence of actuation cost more sensors, while the full actuation makes the grasp weaker than it's supposed to be. The correct actuation to use was only the two fingers' joints to reach the expected grasp and at the same time making the hand in the disposal cost less servos.

Tools used for research/project

The main tools to be used in the thesis project are:

- **ATMEL 89C51**: Chosen for its frequency and Used to control the robot like the brain due to its three data ports that control different constitutions.
- **5804B Stepper Controller**: Chosen for its multi uses and unipolar motor controllers. It gives out the needed signals to turn on the stepper motor accompanied with a switch to turn it on/ off and pin to change its direction. Not only that, with an IC available the pins are protected and a correct 1,2A interval current and torque by the motor.

- **Relays for DC Control:** Chosen for its 12volt relay, which isolates the DC motor from the microcontroller's signals in order to protect the controller with a larger current.
- **4N25 Optocoupler:** Chosen for its constitution of silicon NPN phototransistor and gallium arsenide infrared LED. It isolates the microcontroller for a safe DC motor relay driving.
- **ULN Laser:** Used for its ability to create cohesion and balance between high power of the DC motor and the low-level circuits.
- **Relay:** used as a switch to turn on the DC.
- **MA232 Level converter:** unlike the TTL voltage, it uses the RS232 format of voltage. It is responsible of the internal converting between the voltage levels.
- **LC Wireless Transmitter:** Chosen for time and cost saving, having an online availability and its Modulation at 433MHz. Its specialty is to use a radio frequency via a wireless link to send data from the application to the robot.
- **LC Wireless Receiver:** At 433MHz, the receiver gets the serial data by being connected to the microcontroller's serial port. The receiver is connected to the transmitter to get serial data given by the application.

CONCLUSION

Software Tolls Used for Programming the application
Microsoft visual Basic: Chosen for its ability to control the arm via Joystick. It develops the application with its video feedback, suitable signals, and accurate movements to the robot.The Microsoft Basic uses:

Microsoft COMM Control: Used for serial communication between the application and the microcontroller.

VB Skinner Pro2 Control: designed with GUI control features

Video Cap Live ActiveX Control: Used by the application give a video feedback from the microcontroller.

JK Joystick2 control: used to control the arm through the application.

Micro controlling programming
ASM51 Assembler: Generate and receives from the Assembly code the hexadecimal code. Its microcontroller programming has been done by Assembly language.

EZDownloader4: Connected with the AT89c51 Programmer to generate electricity to the microcontroller.

Assembly Language: includes all the microcontroller's codes.

ref_str

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