ROBOT TRACER WITH VISUAL CAMERA

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Abstract - Robot is a versatile tool that can function replace human work function. The robot is a device that can be reprogrammed according to user needs. The use of wireless networks for remote monitoring needs can be utilized to build a robot that can be monitored movement and can be monitored using blueprints and he can track the path chosen robot. This process is sent using a wireless network. For visual robot using high resolution cameras to facilitate the operator to control the robot and see the surrounding circumstances.

1. Introduction

The development of robotics technology has brought many changes to all areas, such as industry, medicine, manufacturing, space exploration and construction. Self-propelled technology has long been the goal of researchers and producers. The application of autonomous vehicle technology that is able to move it without being driven by human beings has long been a dream. In addition to providing convenience it also reduces the number of errors due to human factors. One of the revolutionary developments is the unmanned aircraft technology. Which can fly in a controlled way from a distance without having to have a pilot inside. The work presented in this study is the use of robots that are given the ability to back and forth independently and avoid all obstacles that exist around. The modeling of the environmental structure of this study is (ignored). It is expected that this robot can overcome the problems that occur when experiencing various obstacles that occur. Utilization of autonomous navigation means to make the robot move in the surrounding environment without colliding with objects around it. This mobile robot is controlled by a computer that communicates wirelessly from an existing computer monitoring center. The moving robot consists of several classifications. Among them wheeled robots are usually used for field investigations with terrestrial or soil surfaces. Flying robots are usually used for unmanned flight purposes. Underwater robots are usually used for underwater investigations, or ice surfaces and others. Robot navigation aims to guide the direction of movement of the robot and represent the circumstances surrounding it and send monitored of data center information. And expected with zero error or minimum error.
2. Robot Working System

*In* the Central monitoring console there are two parts that serve to capture the image around the robot and send to the console database. High-speed control systems are sent using 4G or WiFI for data to be transferred properly.

A. Data sheet will be accepted by the robot transceiver system.

As a microcontroller issued a control signal that serves as a dual motor drive input connected which robot scent. The high-resolution camera is designed in such a way as to take real-time images from around the robot and send them via 4G or Wi-Fi.

![Fig 1. Robot diagram system](image)

B. Design of Robotic Vehicle Unit

The chassis is designed such a way by design using many holes to facilitate the installation of components needed for making the robot. Two the rear wheel and front wheel are designed for normal speed and to reduce complexity when moving in circuits. If both motors rotate in the same direction, the robot moves straight ahead or backward. If one motor is running faster than the other, the robot takes turns to the left or right and if both motors run at the same velocity the opposite, the robot will rotate in a circle. The wheels are connected to DC motors due to their high efficiency, high quality and low cost. The batteries required for the operation of this robot vehicle are stored under a metal chassis and should be placed right in the center of the vehicle mass to improve the stability to make the weight more balanced.

C. Robotic Vehicle Design Formula

The design of robotic vehicles is discussed in this section:

Torque = Style x Radius  That is,

\[ T = k \times F \times R \]

The \( k \) value is the scaling factor and is taken as \( 1/20 \).

Motor torque, \( T = 5 \text{ Kg cm} \),

Wheel radius, \( R = 3.5 \text{ cm} \) \( 5 = 1/20 \times F \times 3.5 \) That is,

\[ F = \frac{(5 \times 20)}{3.5} = 28.6\text{Kg} \]
This design allows weight to move the robot to the desired direction according to the control of the control center

3. Software and Hardware.

Utilization of software in helping the robot work here has an important role. The hardware used also has a very important role in data processing. The software used include: Windows XP platform or higher. Then the Math Lab Application to simulate the data received in the form of graphical display. Then 4G rival for high speed data communication. While hardware such as processors and microcontrollers also have an important role. The processor used should have a high specification. Ag Core Processors i5 and i7, Microcontroller AT89C52 which has a flash memory of 8K. C programming language is coded embedded in microcontroller according to user needs. Transceiver part will send data via Bluetooth to the microcontroller. The control system depends on the code it receives. The code will be changed by the microcontroller into a signal which then controls the signal to the motor driver IC L293D. Then the driver IC will drive the motor according to the given signal.

4. Detail Implementation

Fig 2 Diagram Implementation

Laptop as a control center apply the concept of real time in order to transit data continuously. Images taken by the camera will be converted into JPG, or JPEG form. The MATLAB application converts pixel changes that represent a change of direction. There are 4 codes used: F for forward movement, H for backward movement, L for left movement and R for right movement. The image image given to it will be converted into a set of codes. This code is sent wirelessly to the robot. Communication of laptop data to the robot using Bluetooth module. This transmitted code will be read by microcontroller and converted into a signal. Then forwarded to Driver IC L293D which has 2 outputs to drive a wheeled motor owned robot that serves to drive the robot.

The differential drive system will work in accordance with the given current. If the positive polarity of the name is given, then the motor will move in the same direction. But if the opposite, then the motor will move in the opposite direction. The camera phone is installed using a visual feedback system designed to capture images around the robot wherever it moves and is sent back to the laptop via Bluetooth. The MATLAB program is connected to the computer using the serial port (COM). The User Interface (GUI) graphic shown in MATLAB is used as a software to control the movement of robots. The GUI uses the CLI command (Command Line Interface) where the command must use the keyboard. START, RESUME and STOP are the Hyper terminal commands in the GUI window. The picture below is a screenshot of the GUI when input is given. The black line is a clumsy input.
Fig 3 The state before the screenshot START button is pressed

When the start button is pressed, the robot starts moving. This is visible from the black path. Then a red line will appear, indicating the state that the code has been sent to the microcontroller and will be converted into a signal to fine-tune the two motors according to the state of the given signal.

Fig 3 The state After the screenshot START button is pressed

If there are obstacles that exist in front of the robot, then the user pressing the STOP button that causes the movement of the robot to stop. At the same time also the red line will stop. When the obstacle pulls away from the front of the robot, the user presses the RESUME button, and the robot will move to the last stop point and the red line will be traced back from the last point stalled. And so on until the entire track is tracked.

5. Conclusions
Control of robots can be done centrally. The monitoring system designed to allow users to perform remote control. The visual feedback the operator receives serves to see if the robot is moving or not. The concept is executed in real time.

6. References

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