Type X

ME 3484
Final Project
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Overview

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Proposal

- A transformable vehicle that could alter its wheel position in order to navigate around difficult situations
- Designed to be used in a rough terrain environment
- Advantageous in civilian as well as military applications
Problem 1

- Wide body vehicles can have difficulty crossing narrow bridges
- Military vehicles and tanks need wider bridges to get across
Solution I

- Reduce the width of the wheels
- Alter wheel position by rotating 180 degrees
- Wide body vehicle can now cross a narrower bridge.
Problem II

- Parking in cities can be a hassle
- Parallel parking is complicated
Minimize the size of the vehicle
Park at a different location
Valet parking
Solutions II

- Wheels would turn 90 degrees
- Vehicle eliminates the need for parallel parking
- Vehicle can be prevented from being stolen
Features

- A military vehicle that alters wheel position to fit through narrow roads or bridges.
- Rotate wheels 90 degrees to eliminate the need to parallel park.
- Presents new safety feature to assure theft prevention.
- Master switch for emergency shutoff
Project Specifications I (Hardware)

- BS2 and Board of Education
- 4 high torque servos
- 4 DC motor
- 2 motor controller
- 2 push button
- At least 3 IR sensor
- LED (optional)
Limitations and Assumptions

- A driver is required to operate the vehicle
  - Driver makes the decision to park or to alter wheel position.
- Obstacles must be large enough to be detected by the IR sensors.
- Sensors can be replaced.
  - Sonar, Proximity, Camera, etc.
- Speed is constant.
Design Process

- Design & build the Chassis
- Paint
- Mount Servos
- Mount DC Motors
- Wire circuitry
- Basic Stamp Code
- Testing
Circuit Diagram I
Circuit Diagram II

- Circuit for Button 2
  - Vdd
  - 1K Ohm
  - 10K Ohm
  - Pin 3

- Circuit for Button 2
  - Vdd
  - 1K Ohm
  - 10K Ohm
  - Pin 2

- Motor 1
  - To Motor controller

- Motor 2
  - To Motor controller

- Motor 3
  - To Motor controller

- Motor 4
  - To Motor controller

- IR Sensor
  - LED

  - Black
  - Yellow
  - 10K Ohm
  - Pin 4
  - Red

  - Black
  - Yellow
  - 10K Ohm
  - Pin 5
  - Red

- IR Sensor
  - LED

  - Black
  - Yellow
  - 10K Ohm
  - Pin 6
  - Red

  - Black
  - Yellow
  - 10K Ohm
  - Pin 7
  - Red
BS2 Code
Block Diagram

START
Button 1: Parking
Button 2: Driving

Possible Narrow Bridge Detected?

Possible Parking Found
Button 1: Keep Looking
Button 2: Park

Park

Keep Looking

Turn Wheels 90 Degrees

Move In

Stop Button 1 to Move Out

Button 1 Pressed

Move Out

Button 1 Pressed

Turn Wheels to Initial Position

Drive

Stop. Wait Until Button 2 is Pressed

Button 2 Pressed

Turn the Wheels Inside
Start Moving

Detect the End of the Bridge (Detect the Ground)

Stop. Turn the Wheels Outside. Drive

Button 1 Pressed
Keep Moving

Yes

Button 1 Pressed Again

No

NC

Button NOT Pressed

Yes

Button 2 Pressed

Yes

NC
Computer Code

Project.bs2
Bridge Demo

Bridge Demo.AVI
Parallel Parking Demo

Parallel Parking.AVI
# Cost Estimate

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Future Improvements

- Place the button outside for better prototype user interface
- Replace current sensors with better sensors
- Eliminate the bread board and solder all connections
- Make it a remote control vehicle
Conclusion

- Servos were able to turn 90-180 degrees and back to its initial position.
- IR sensors detected if enough space was available to park car and to detect if the road narrows.
- Defective motor controllers prevented the DC motors to drive the vehicle.
Special Thanks and Acknowledgement

- ME 3484, Mechatronics 1: Faculty, Staff, and Students
- www.pololu.com for technical support
- www.acroname.com for IR sensor schematic
- www.ebaumsworld.com for video clip
- Alessandro Betti, Technician