DETACHABLE
POTHOLE DETECTION AND WARNING
SYSTEM

Kwok Yu Mak
Valentin Siderskyi
Lamia Iftekhar
Existing work

• Obstacle detection
  – Mechanical
  – Image processing
  – Mostly protruded obstacles

• Autonomous avoidance
Current needs

• Pothole detection
  – for baby strollers, wheelchairs, grocery carts etc.

• Warning system only
  - not autonomous control
  - wheelchair users prefer manual control
  - too risky for baby strollers
Project Objective

- To build a handy, detachable, user-friendly device that can be mounted on a variety of human-manuevered slow-speed vehicles.

Focus on: baby strollers
Detection method

• Attempt
  – Mechanical extension: bulky, already done
  – Laser sensors: too sensitive, costlier

• Chosen
  - PING)))™ Ultrasonic Distance Sensor (#28015)
Warning Method

• Vibration Motor
  – Can be turned off if desired
• LEDs
  – Two for obstacles
  – Two for battery levels
  – On/off
• Battery meter
  – Using voltage divider
Overall structure

- System A attached to front of vehicle
- System B worn on wrist
Mechanical Design
System A
Mechanical Design
System A: close-up
Mechanical Design
System B
Mechanical Design
System B: Vibrator Motor close-up
Circuit of System B
Circuit Diagram
System A
Circuit Diagram
System B
'----------Search for critical angle----------

getcriticalAngle:
GOSUB getDistance

IF 2260*distance1 < 300 THEN
  motorAngle1 = motorAngle1 + 1
  FOR counter = 1 TO 10
    PULSOUT motor1, motorAngle1*10
    PAUSE 20
  NEXT
GOTO getCriticalAngle
ELSEIF 2260*distance2 < 300 THEN
  motorAngle2 = motorAngle2 - 1
  FOR counter = 1 TO 10
    PULSOUT motor2, motorAngle2*10
    PAUSE 20
  NEXT
GOTO getCriticalAngle
ELSE
  motorAngle1 = motorAngle1 - 1
  motorAngle2 = motorAngle2 + 1
  FOR counter = 1 TO 10
    PULSOUT motor1, motorAngle1*10
    PULSOUT motor2, motorAngle2*10
    PAUSE 20
  NEXT
GOSUB getDistance

ENDIF
'-------- Detect Pothole--------------'
detectPothole:
DO
    GO SUB getDistance
    IF 2260**distance1 > (initialdistance1 + 5) AND 2260**distance1 < 100 THEN 'right
        warning = 2
    ENDIF
    IF 2260**distance2 > (initialdistance2 + 5) AND 2260**distance2 < 100 THEN 'left
        warning = 4 + warning
    ENDIF
    IF battery = 0 THEN
        warning = 1 + warning
    ENDIF

    PULSOUT 7, 1200
    SEROUT 7, 16460, [ "!", warning]
    PAUSE 10
    warning = 0
LOOP
END

'-------- Get Distance ---------------'
getDistance:
    PULSOUT ping1,5
    PULSIN ping1,1, distance1
    PULSOUT ping2,5
    PULSIN ping2,1, distance2

    DEBUG CLS, DEC 2260**distance1, " ", DEC motorAngle1*10, " ", DEC initialdistance1
    DEBUG CR, DECS 2260**distance2, " ", DEC motorAngle2*10, " ", DEC initialdistance2
    DEBUG CR, DEC battery
    PAUSE 100
RETURN
PBasic Code
System B

' pin 7 left
' pin 6 right
' pin 8 receiver
' pin 9 ON/OFF
' pin 11 hand held battery
' pin 13 cart battery
' pin 2 battery meter
' pin 0 motor control

control VAR Byte
'control
'LSB down TO msg
'0 cart battery active high
'1 right
'2 left

HIGH 13
DO
OUT11 = IN2 ' handheld battery
SERIN 8, 16468, [WAIT("!")], control
IF control < 7 THEN
OUT13 = ~control.BIT0
OUT6  = control.BIT1
OUT7  = control.BIT2
IF control >= 2 THEN
OUT0 = 1
PAUSE 500
OUT0 = 0
ENDIF
ENDIF
LOOP

LOW 9 'power
## Prototype Cost

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<th>Quantity</th>
<th>Price per item ($)</th>
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CONCLUSION

• Prototype was successful
• Possible improvements
  – Smaller wrist part
  – Earlier detection of potholes.