MECHATRONICS ME 5643

FINAL TERM PROJECT

SMART MOUSE TRAP

By

Team# 8

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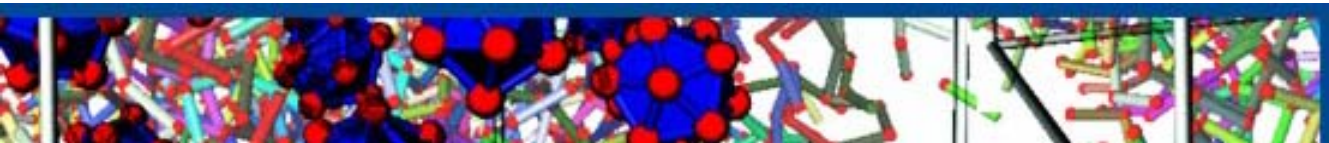

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Outline

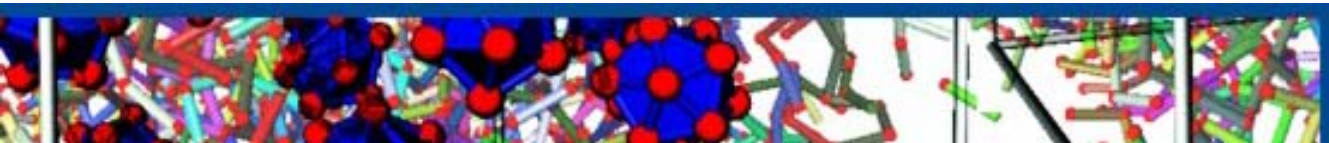
Introduction

Materials and methods

- Sensors and their calibration
- Circuitry
- Program

Results

Demonstration



Introduction

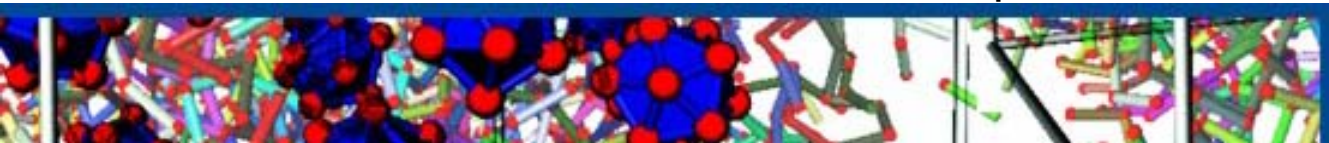
- A smart mouse Trap despite its cost is the ideal solution to trap a mouse alive and therefore avoid all the inconvenience from putrefaction.

- Advocate for animal protection might also find this house appliance ideal to catch an animal without killing it.

- The device relies on the infrared light detection which is invisible to animal. Emitters coupled to a receiver are placed at opposite end of the cage.

- The circuit is controlled by a Parallax Basic Stamp processor which checks at any time the presence of the light beam.

- When the IR light beam is interrupted, a buzzer sound, the LED light, a message is displayed and the servo closed the gate until a human remove the mouse from the trap.



Sensors – IR Sensor Emitter and Receiver

IR Emitter emits light beam at 40 kHz

The frequency is set to distinguish the beam from other source of IR

IR receiver detect the beam and sent a signal to the BS2

Distance range is about 1 m in air

Figure 1: Infrared Sensor, emitter and Receiver

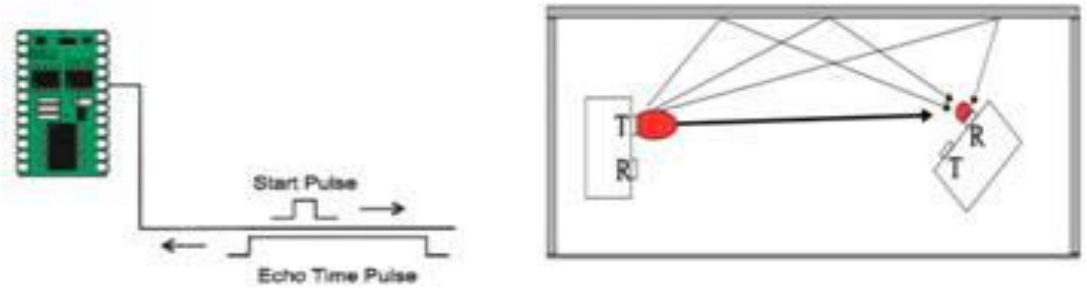
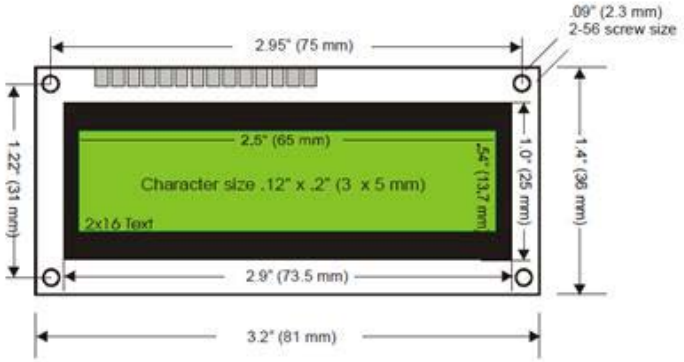


Figure 2: Functional Mechanism of the Infrared Sensor

Liquid crystal display

A Parallax 2x16 serial liquid crystal display (LCD) component is used as a user interface



Displays messages

Others components: Piezo, LED, Button, Servo

Test

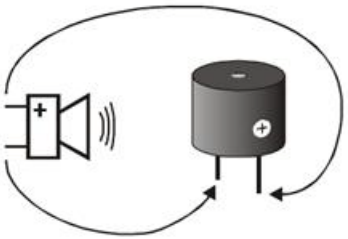
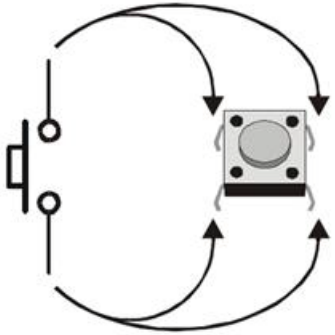


Figure 5-2
Piezo Speaker

Circuit symbol and part.



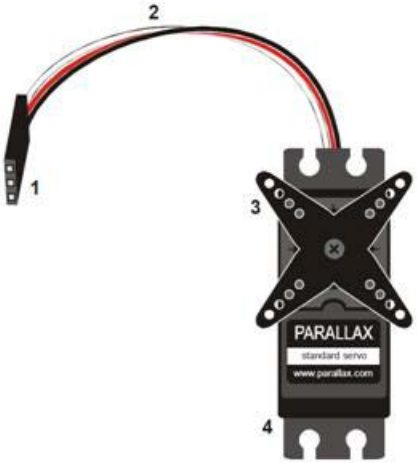
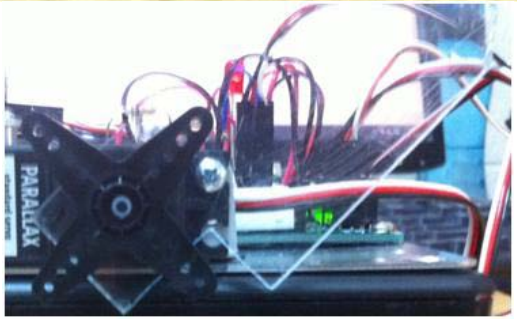


Figure 4-1
The Parallax Standard Servo

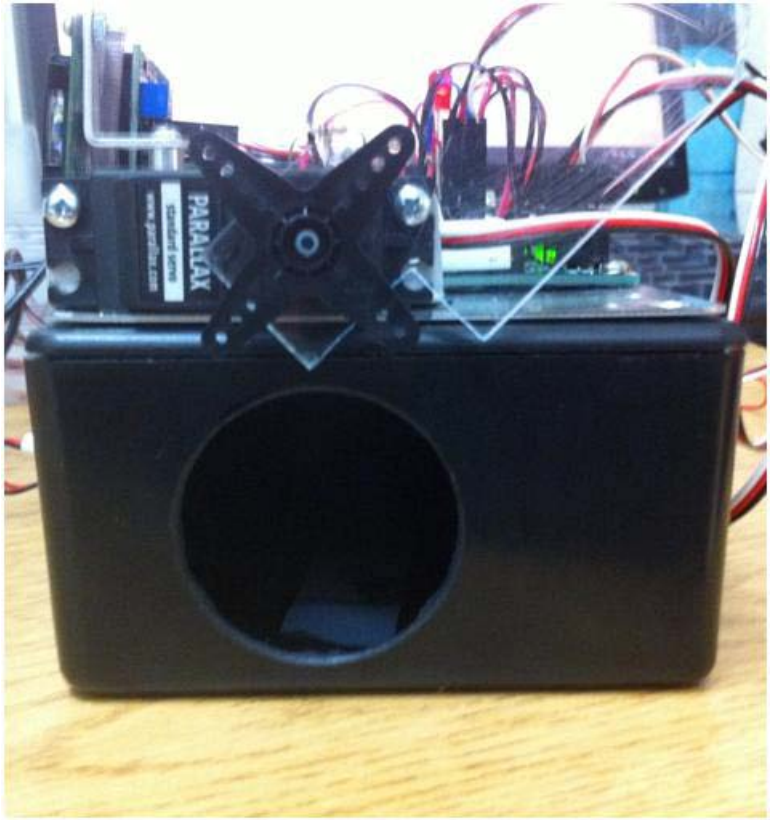
(1) Plug
(2) Cable
(3) Horn
(4) Case

Mouse Trap Box Specifications

- Plastic box for the enclosure
- Plexiglas for the gate
- Holes were drilled in several locations in order to allow:
  - ✓gate for mouse to enter the box
  - ✓wiring between sensors and the BS2
- Dimensions: **5x2.5x2“**
- Hole: 2” diameter

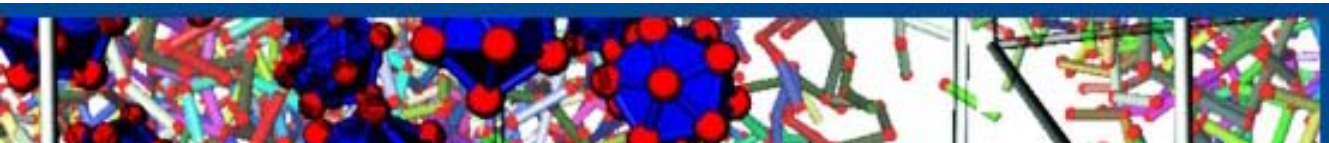


Device



Cost of material

	Material	Cost per unit ($)	Quantity	Total cost ($)
1	IR sensors Emitter and Receiver	$20.00	1	$20.00
2	2 mm thick Plexiglas	$105.00/$m^2$	0.016 m^2	$15
3	LCD display	$25.00	1	$25.00
4	Servo motor	$13.00	1	$13.00
5	BS2 microcontroller	$100.00	1	$100.00
6	Button	$3.19	1	$3.19
7	AA battery	$1.00	1	$2.00
8	Project Enclosure (5x2.5x2")	$5.49	1	$5.49
			TOTAL PROTOTYPE COST =	$183.68



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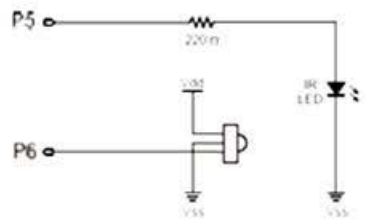
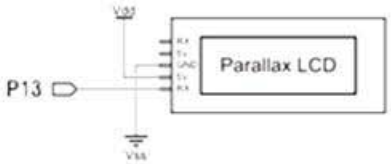
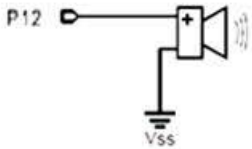
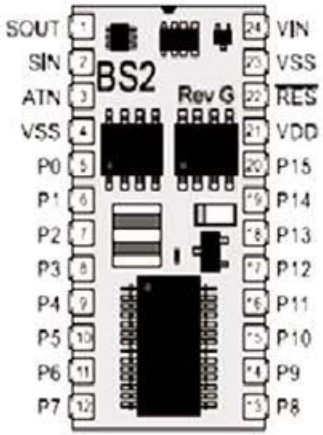
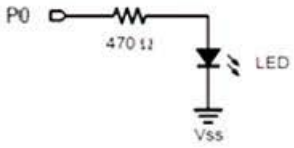
Circuitry

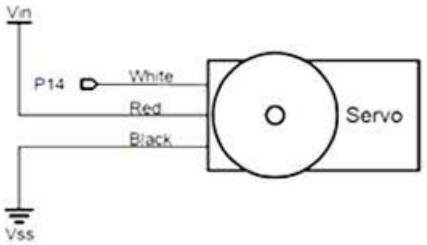


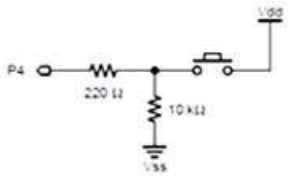


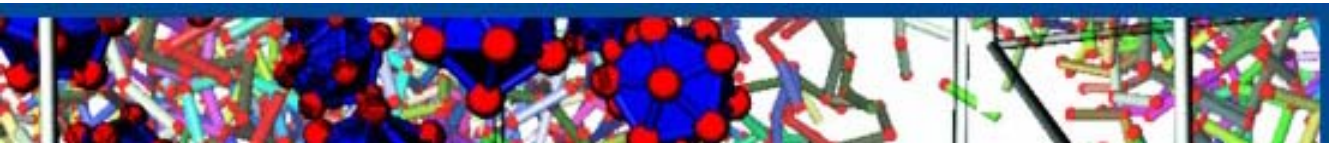












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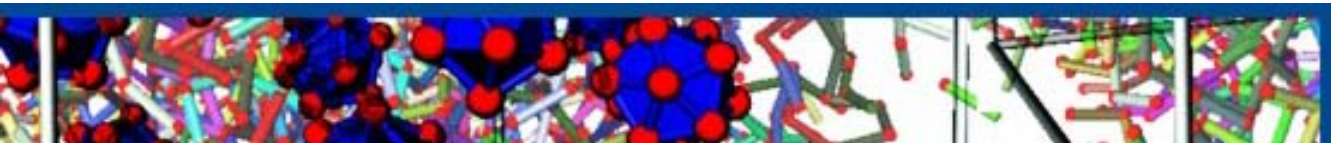
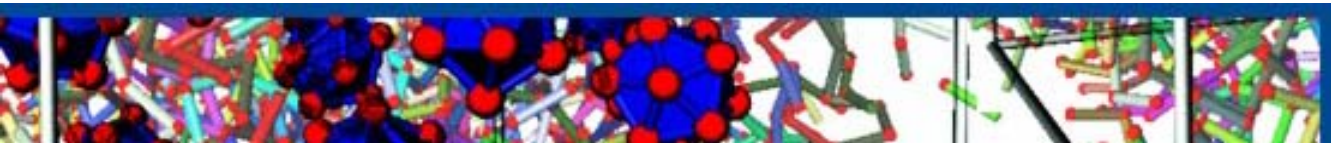
PBASIC code

```
'   {$STAMP BS2}
'   {$PBASIC 2.5}

' Declare variables
'LCD enable PIN 14 (1 = enabled)
  WLED          CON     13                ' Warning LED Output
  ALM           CON     12                ' Alarm Output Pin
  Srvo          CON     15                ' Servo Control Pin
  IFR           CON     8                 'infrared pin
  Pos           VAR     Word              ‘command the motor position
  Cnt           VAR     Byte              ‘counter for motor
  Counter       VAR     Byte              ‘counter for piezo

  IR_detect     VAR     Bit               ‘var Ir detect or not
  btnWrk        VAR     Word              ‘Button variable
```



Pbasic code

```
' -----[ Program Code ]----------------------------------------------------

main:

  GOSUB IniMess
  PAUSE 5000

  Pos = 1250            'open the gate
  Cnt=1
  GOSUB PanServo

  LOW 7
  here:
     PAUSE 50
     FREQOUT 5, 1, 38500
     IR_detect = IN6

  IF IR_detect = 0 THEN unbroken

     GOSUB Alarm
     GOSUB WRLCD

  GOTO here

     unbroken:

       GOSUB LCDcmd
       GOSUB press

  GOTO here

RETURN
```



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Pbasic code: subroutines

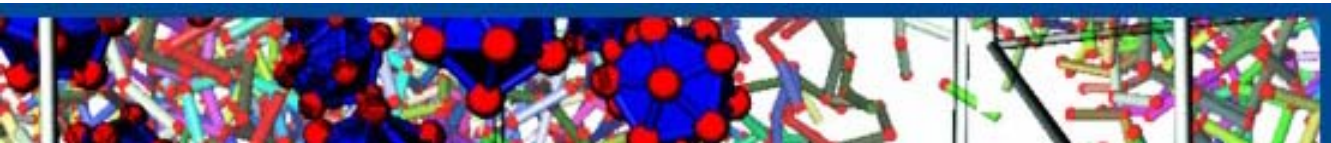
```
'-----[ Subroutines ]-------------------------------------------------------

   IniMess:                                    ' Initialize the LCD
     SEROUT 14, 84, [22, 12] ' Initialize LCD
     PAUSE 5
     SEROUT 14, 84, ["Mouse Trap", 13, ' Text message, carriage return
                    "Team 8 2012!"] ' more text on line 2.  ' LCD to character mode
   RETURN


   Alarm:
     Pos = 500
     HIGH WLED
     cnt=1
     GOSUB PanServo
     FOR counter=1 TO 3
     FREQOUT ALM, 500, 5000
     NEXT
   RETURN

   LCDcmd:
     SEROUT 14, 84, [22, 12] ' Initialize LCD
     PAUSE 5
     SEROUT 14, 84, ["Awaiting Mouse", 13, ' Text message, carriage return
     "Team 8 2012!"] ' more text on line 2.  ' LCD to character mode
   RETURN

 WrLCD:  'OUTC = char >> 4                   ' output high nibble
    SEROUT 14, 84, [22, 12] ' Initialize LCD
     PAUSE 5
     SEROUT 14, 84, ["Mouse Trapped!", 13,' Text message, carriage return
     "Bingo"] ' more text on line 2.
     PAUSE 5000
     RETURN
```



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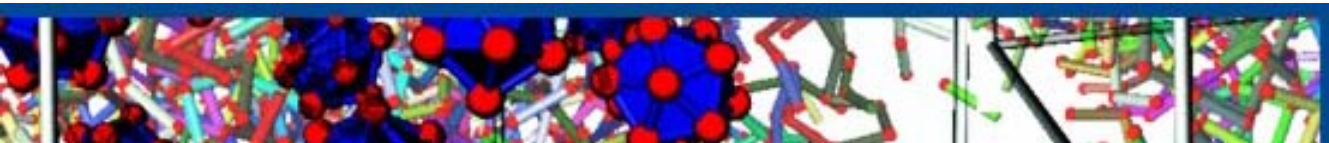
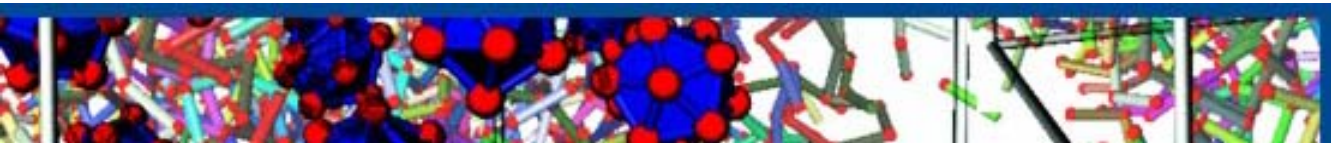
Pbasic Code

```
PanServo:                'subroutine to control the servo
PULSOUT Srvo , Pos
PAUSE 10
Cnt = Cnt + 1
IF Cnt <> 40 THEN PanServo
RETURN

opengate:
Pos = 1250
  Cnt=1
  GOSUB panservo
  LOW WLED
  RETURN


press:
DIR0=0
LOW 0
BUTTON 0, 1, 255, 250,btnWrk,1,opengate   'The button is at pin 0
'PULSOUT 14, 1050
PAUSE 20
RETURN
```



Operating Instructions

1. Verify the battery or the power supply of the device.
2. Turn the switch of the BS2 in mode 2
3. A message is displayed on the screen and after 5 seconds, the gate opens and the trap is ready to operate
4. A message displays “Awaiting mouse”
5. When a mouse interrupt the IR light beam, the door closed, the LED lit and the buzzer sounds.
6. The door remain closed even if the IR beam is reestablished
7. To remove the mouse, press the button and the gate open
8. The device is ready to operate again.
9. No calibration is required to operate.
10. Avoid putting the device in a wet area.



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4) Parallax Inc, BASIC Stamp Syntax and Reference Manual version 2.2, 1994-2005

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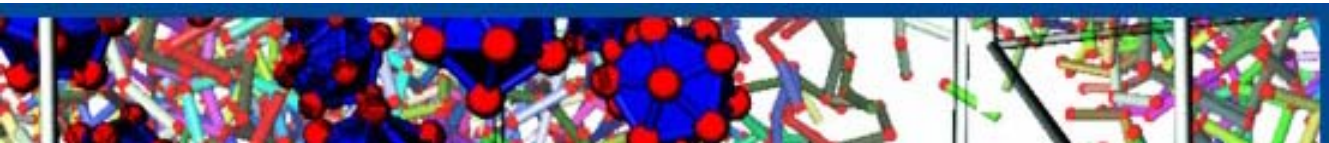
6) Parallax Inc, Stamp Work, Experiments and Basic Stamp source code, 1994-2005



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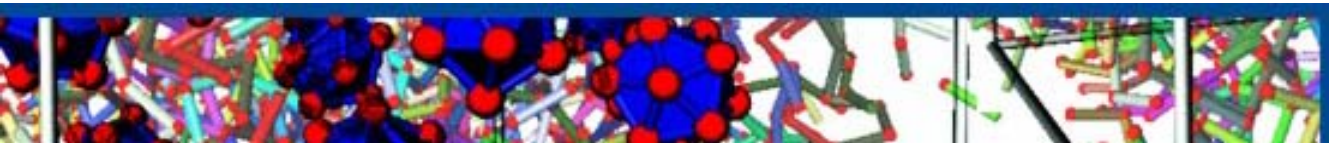

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