IPhone Controlled Robotic Project

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The iPhone
Features and Technology

- Internet-able mp3 player, camera, and smartphone
- Less than 140g (5oz)
- Fast & reliable performance
- User-friendly graphical interface
The iPhone
Features and Technology

• Wi-Fi Capability
• 3G Network Capable
• Internal 3-axis accelerometer
• GPS
User Datagram Protocol (UDP)

Disadvantages

- Unreliable
  - Doesn’t check if transmitted data was received
- Does not check for errors

Advantages

- Connectionless protocol
  - Leads to it being faster
Open Sound Control (OSC)

- Versatile, real-time message-based protocol
- Originally intended for the music industry
Communication between iPhone and wireless router.

Software used was iOSC ( )
The MAKE Controller

- Built-in Ethernet
- Easy to use
- C-based program
- Hardware OSC implementation
What’s Been Done

- iBoe-bot
- Smart House
- RC Truck
Project Summary

iPhone → Wireless Router → MAKE controller

iPhone

Wireless Router

MAKE controller

Messenger BS2 (Transceiver) → Boe-Bot BS2 (Transceiver)
BASIC Stamp 2 Communication

Messenger BS2

Boe-Bot BS2
Serial ports, also called communication (COM) ports
Basic physical connection to a computer
Well over 20 years
Uses flow control
Newer systems favor USB connections
Serial Communication

- Serial devices use different pins to receive and transmit data
- Multiple pins allow for messages to be sent in both directions simultaneously
- Powerful, widely used engineering software
- Data Acquisition, Processing, Computation, and Control Applications
- Receives sensory data from the messenger BS2
- Displays / plots data and processes for future use
Main:

SERIN SI\FC, baud, timeout, SendRF, [cmd] ' receive one byte
GOTO SendRF

SendRF:

PULSOUT txpin, rfpulse 'Sync pulse for the receiver
SEROUT txpin, baud, ["!", cmd]
PAUSE 10
IF (cmd = 0) THEN
    SERIN rxpin, baud, 100, Main, [WAIT("!")], light]
    SEROUT 16, 84, [DEC light, CR]
ENDIF
GOTO Main
Boe-Bot BS2 Program

Main:
GOSUB ReadRF
GOTO Decision
'GOSUB Display

ReadRF:
SERIN rxpin, baud, [WAIT("!"), cmd]
RETURN

Decision:
DEBUG ? cmd
IF (cmd = 1) THEN
GOTO Forward
ELSEIF (cmd = 2) THEN
GOTO Rotate1
ELSEIF (cmd = 3) THEN
GOTO Rotate2
ELSEIF (cmd = 4) THEN
GOTO Backward
ELSE
GOTO NoMove
ENDIF
GOTO Main

NoMove:
HIGH sensor
PAUSE 10
RCTIME sensor,1,light 'measure the light intensity on the sensor
'DEBUG ? light
PULSOUT txpin, 1200 'Sync pulse for the receiver
SEROUT txpin, baud, ["!", light]
PAUSE 10
GOTO Main Forward:
PULSOUT 13, 850
PULSOUT 12, 850
PAUSE 15
GOTO Main

Display:
SEROUT LCDPin, baud, [22, 12]
PAUSE 5
SEROUT LCDPin, baud, ["cmd=", DEC cmd]
SEROUT LCDPin, baud, [128]
RETURN

Rotate1:
PULSOUT 13, 650
PULSOUT 12, 650
PAUSE 15
GOTO Main

Rotate2:
PULSOUT 13, 850
PULSOUT 12, 850
PAUSE 15
GOTO Main

Backward:
PULSOUT 13, 650
PULSOUT 12, 850
PAUSE 15
GOTO Main
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Circuits

Photoresistor RC-time Circuit Schematic
Circuits

5 V

RF Transceiver

TX

RX

NC

1

2

3

4

5

6

7

8

9

10
Conclusions

Last Summer’s Long-term Goals

- Data Acquisition
- Control✔
- Experiment/Equipment communication✔
- BASIC Stamp interfacing✔
- A remote CPU for mechatronics applications
Conclusions

• Removed the Router/MAKE from the project
• Discovered communication with MATLAB/Simulink
  ➢ For interfacing with lab equipment/experiments.
• Designed and Built DAC platform
  ➢ For interfacing any RF mechatronic/robotic project.
Conclusions and Future Goals

Virtual Environment

Mechatronics Systems
- iRobot
- BOE-Bot
- RC Truck
- Smart House
- DC Motor

iPhone

OSC Send

OSC Receive
Future Goals

- Receiving and displaying data on the iPhone
- Programming a custom iPhone graphical user interface
- Alternative methods of communication and control
- Using iPhone sensors (accelerometer, compass, GPS...)
- Direct iPhone $\leftrightarrow$ MATLAB
- More advanced applications
  - CRS Robotic Arm
  - RC Airplane
  - Robotic Fish