Lecture 3 – Robot Motion

Motor Control

- The right and left motors are controlled by signals on pins 12 and 13. Instead of using just a HIGH or LOW signal to turn the motors on or off (like the LEDs), motor speed (and direction) are determined by the duration of a high voltage pulse on the motor control pin.

- PULSOUT actually inverts the signal at a PIN so to be sure to send a HIGH pulse we must set the PIN LOW first. Here is code to turn the RIGHT motor on at full speed for 5 seconds and then stop the motor:

  ```plaintext
  LOW 12 ' REQUIRED
  PAUSE 100 ' INITIALIZATION!!
  PULSOUT 12, FwdFull ' Full Speed
  PAUSE 5000 ' 5 seconds
  PULSOUT 12, StpFull ' Stop
  ```

- With these declarations the following program will send the robot forward at full speed for 5 sec, stop for 5 sec, full reverse for 5 sec, and then stop:

  ```plaintext
  LOW RtMotor ' REQUIRED
  LOW LtMotor ' INITIALIZATION!!
  PAUSE 100
  PULSOUT RtMotor, FwdFull
  PULSOUT LtMotor, FwdFull
  ' Cont. on next slide ...
  ```

- The PIN declaration can be used to assign a label to a particular PIN. The CON declaration can similarly be used to assign a label to a constant value:

  ```plaintext
  RtMotor PIN 12
  LtMotor PIN 13
  FwdFull CON 3000
  RvrFull CON 1000
  StpFull CON 2000
  ```
Lecture 3 – Robot Motion

Motor Control

PAUSE 5000
PULSOUT RtMotor, StpFull
PULSOUT LtMotor, StpFull
PAUSE 5000
PULSOUT RtMotor, RvrFull
PULSOUT LtMotor, RvrFull
PAUSE 5000
PULSOUT RtMotor, StpFull
PULSOUT LtMotor, StpFull
END

Lecture 3 – Robot Motion

Motor Control

● The motors are not identical. A PULSOUT duration of 3000 to BOTH motors may not cause the Scribbler to go straight ahead. If the Scribbler veers to the right, you will need to slow down the left motor by using a duration of less than 3000.

● You will need to follow the calibration procedure on pages 16 and 17 of the Writing Programs guide to find the duration values that cause your Scribbler to go straight.

Lecture 3 – Robot Motion

Variables

● It is convenient to use a variable to label a memory location. You must declare a variable before using it:

  name VAR size

● size determines the range of values the variable can hold:

  BIT 0-1 (1 bit)
  NIB 0-15 (4 bits)
  BYTE 0-255 (8 bits)
  WORD 0-65535 (16 bits)

Always use the smallest size necessary.

Lecture 3 – Robot Motion

Motor Control

This code snippet uses a variable and a FOR loop to smoothly accelerate the Scribbler:

  speed VAR Word
  FOR speed = StpFull TO FwdFull
    STEP 250
    PULSOUT RtMotor, speed
    PULSOUT LtMotor, speed
    PAUSE 1000
  NEXT

Lecture 3 – Robot Motion

Making Music

● The PBASIC FREQOUT command is used to play a tone on the speaker:

  FREQOUT pin, duration, freq1, freq2

The speaker is connected to pin 11. The duration is in ms. freq1 is the frequency (in Hertz) of the tone you want to play. freq2 is an optional second frequency (you can play two tones at once).

Lecture 3 – Robot Motion

Making Music

● The following code plays five tones, each is slightly longer and at a higher frequency than the one preceding it:

  speaker PIN 11
  FREQOUT speaker, 200, 500
  FREQOUT speaker, 400, 1000
  FREQOUT speaker, 600, 1500
  FREQOUT speaker, 800, 2000
  FREQOUT speaker, 1000, 2500
Lecture 3 – Robot Motion Assignment

- Reproduce the effect of the program on the previous slide using a FOR loop and a single FREQOUT command.
- Page 14 of the "Writing Programs" book shows the mapping between musical notes and frequencies. Program the Scribbler to play the beginning of a song ...
- Find the calibration values for your robot and record them. You will need them in the future.