CSE435 – Robotics

Lab 2 – RobotBASIC Sensors

🧠 General Overview

- The robot in **RobotBASIC** has several sensors that let it *feel* and *see* its environment.
- Programs use sensor data to make decisions — e.g., avoid collisions, follow targets, or locate goals.
- This lab introduces **sensor-based control** and key **programming constructs** in RobotBASIC.

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1. Programming Constructs in RobotBASIC

Case Sensitivity

- RobotBASIC is **not case-sensitive** for keywords (IF, if, If all work).
- However, **variable names**, **array names**, and **labels** *are* case-sensitive.

Comments

```
// This is a comment
```

- Anything following // on a line is ignored by the interpreter.

Conditional Statements

Single-line form

```
if condition then action
```

- Executes the action only if the condition is true.

Multi-line form

```
if condition
  action1
  action2
endif
```

With else

```
if condition
  action1
else
  action2
endif
```

Comparison operators

Operator	Meaning

>	greater than
<	less than
=	equal to
<>	not equal
<=	less than or equal
>=	greater than or equal

Loops

For Loop

```
for I = 1 to 10
  print I
next
```

While Loop

```
K = 0
while K <> Ascii("q")
  print Random(1000)
  waitkey K
wend
```

- Use **break** to exit a loop early.

Output Commands

Print to screen

```
print Expr
print Expr, Expr
print Expr; Expr
```

- , → no space
- ; → adds a tab space

Print at specific coordinates

```
XYString X, Y, Expr[, Expr; ...]
```

- Similar to print, but text appears at (X, Y) without scrolling.

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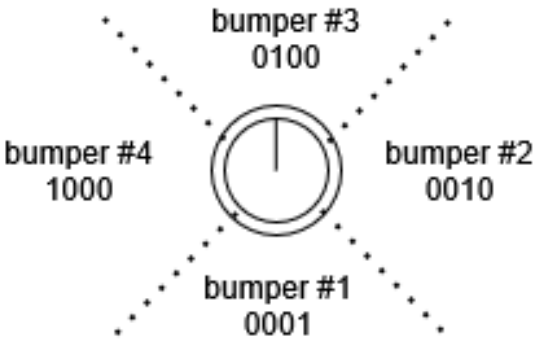
2. Collision Detection with Bumpers

- The robot has **four bumper sensors** around its perimeter.
- Function:

  rBumper()

  Returns a number representing which bumpers are pressed (0 = none).



Example – Stop on Collision

```
rLocate 400, 300

while rBumper() = 0
  rForward 1
wend
```

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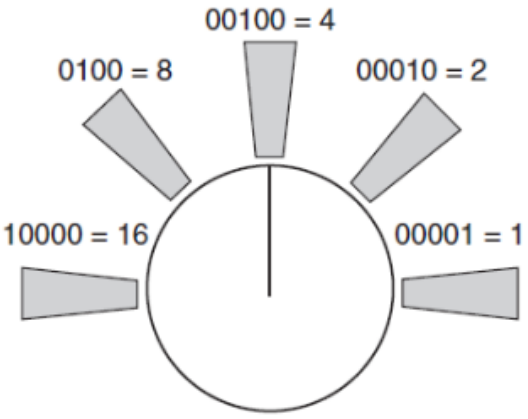
3. Object Detection Sensors

🔹 Infrared (IR) Sensors

- Detect obstacles **without touching** them.
- Work by emitting IR light and detecting reflections.
- Function:

  rFeel()



Example – Stop when Object Detected

```
rLocate 400, 300

while rFeel() = 0
  rForward 1
wend
```

🔹 Ranging Sensor (Ultrasonic / Infrared)

- Detects **distance** to obstacles.
- Function:

  ```
  rRange()
  ```

  Returns the distance in pixels.

Example – Move until object within 20 pixels

```
rLocate 400, 300

while rRange() > 20
  rForward 1
wend
```

🔹 Robot Vision (Camera)

- Detects **colored objects** in the robot's field of view.
- Function:

  ```
  rLook()
  ```

  Returns the detected color.

Example – Turn until red object is seen

```
circle 600, 500, 620, 520, red, red
rLocate 400, 300

while rLook() <> RED
  rTurn 1
wend
```

🔹 Beacon Detection

- Used to locate a **flashing beacon** in the environment.
- Function:

  ```
  rBeacon(color)
  ```

Returns:

- **0** → no beacon detected
- **non-zero** → distance (in pixels) to the beacon

Example – Turn until beacon is detected

```
circle 600, 500, 620, 520, red, red
rLocate 400, 300

while rBeacon(RED) = false
  rTurn 1
wend
```

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4. Navigation & Status Instruments

Function	Description
rCompass()	Returns current direction (degrees).
rGpsX()	X-coordinate of robot center.
rGpsY()	Y-coordinate of robot center.
rChargeLevel()	Returns current battery percentage.