OPTIMIZATION OF PATH FINDING IN ROBOTICS

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Appalachian STEM Academy at Oak Ridge 2022

INTRODUCTION

Robots define our daily lives; they have proved incredibly efficient in manufacturing due to their ability to perfectly complete repetitive tasks and are well suited for missions that would be deemed unsafe for humans. When working with robots, it is critical that they operate as swiftly as possible whether it is for consumer convenience, or the safety of a mission. Using a series of different approaches, robots can be told to follow pre-written instructions or navigate autonomously.

NAVIGATION SYSTEMS

❑Whiskers

- ❑ Adjusts course based on collision detection from tactile sensors
- ❑ Autonomous

Figure 1: Whiskers Robot

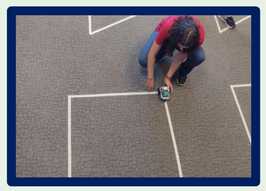


Figure 2: Dead Reckoning Robot

❑Dead Reckoning

- ❑ Strictly follows a precoded path to the best of its capability
- ❑ Nonautonomous

❑Phototransistors

- ❑ Robot uses light-detection sensors to follow light signals generated by user
- ❑ Nonautonomous

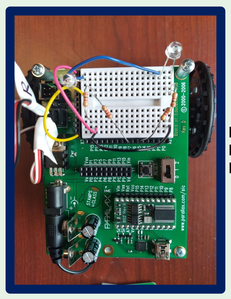


Figure 3: Phototransistor Robot

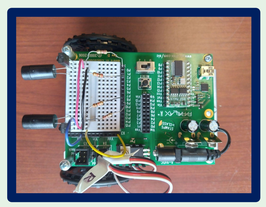


Figure 4: Infrared Receivers Robot

❑Infrared Sensors

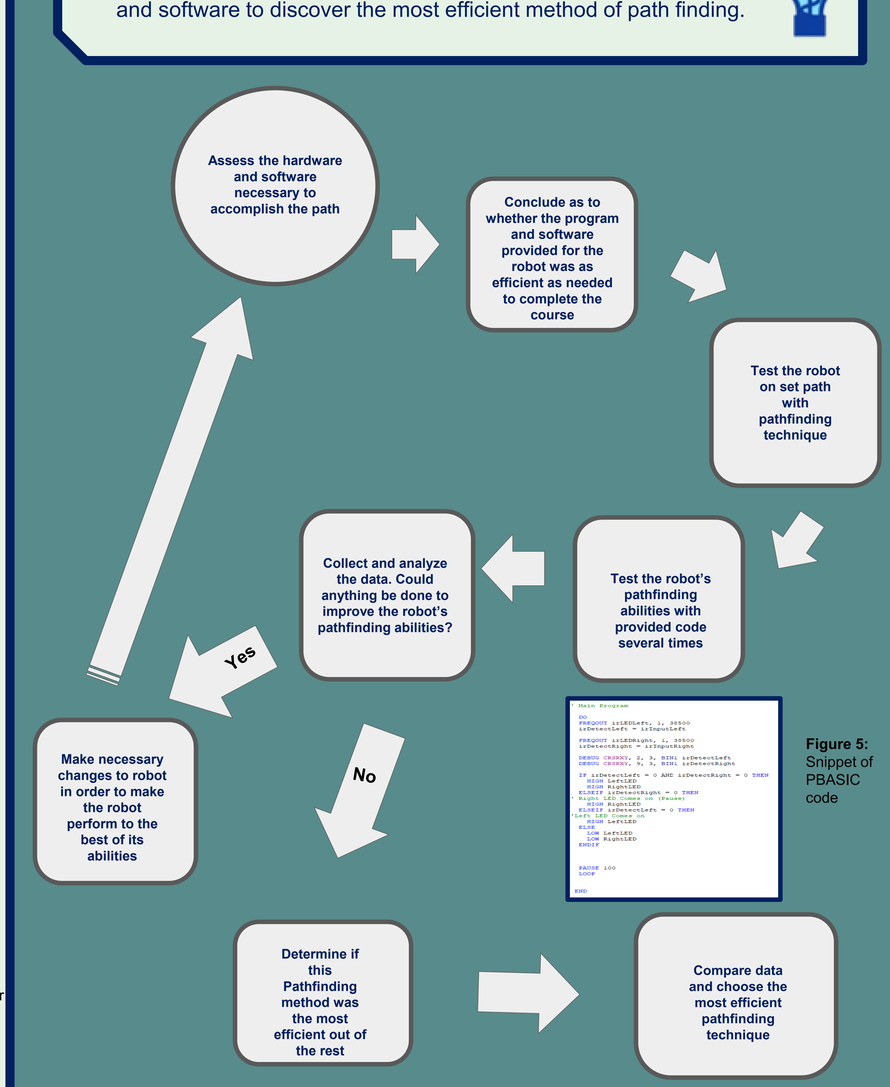
- ❑ Avoids collisions by processing shone light reflected off of obstacles
- ❑ Autonomous

❑Remote Control

- ❑ Remote & robot programmed to communicate with each other
- ❑ Nonautonomous

OUR GOAL

The focus of this project is to utilize the relationship between hardware and software to discover the most efficient method of path finding.




```
' Main Program
DO
  FREQOUT irLEDLeft, 1, 38500
  irDetectLeft = irInputLeft

  FREQOUT irLEDRight, 1, 38500
  irDetectRight = irInputRight

  DEBUG CRSRXY, 2, 3, BIN1 irDetectLeft
  DEBUG CRSRXY, 9, 3, BIN1 irDetectRight

  IF irDetectLeft = 0 AND irDetectRight = 0 THEN
    HIGH LeftLED
    HIGH RightLED
  ELSEIF irDetectRight = 0 THEN
'Right LED Comes on (Pause)
    HIGH RightLED
  ELSEIF irDetectLeft = 0 THEN
'Left LED Comes on
    HIGH LeftLED
  ELSE
    LOW LeftLED
    LOW RightLED
  ENDIF


  PAUSE 100
  LOOP

END
```

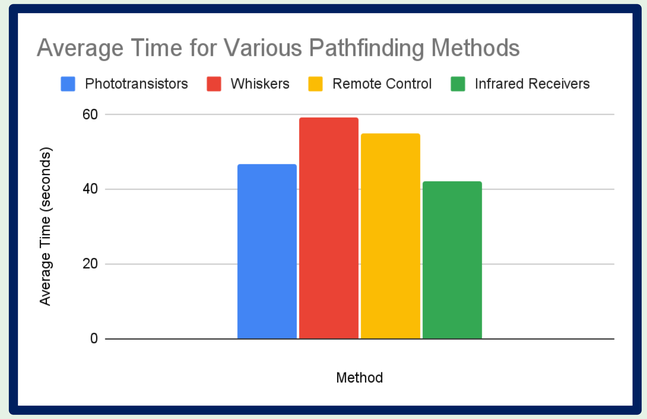
Figure 5: Snippet of PBASIC code

MATERIALS

- ❑ Parallax Boe-Bot Kit
- ❑ Basic Stamp Module
- ❑ Electrical Components: Resistors, Wires, LED's, Servos, Sensors
- ❑ BASIC Stamp Editor Version 2.5

RESULTS

	Pros	Cons
Autonomous:	❑ Consistent ❑ Potential for automation	❑ Inferior performance in maze ❑ Generally slower ❑ Less intelligent
Nonautonomous:	❑ Generally faster ❑ More resilient to entanglements / issues	❑ Inconsistent ❑ Impossible to automate ❑ Human error is incredibly prevalent



CONCLUSIONS

- ❑ Humans are a critical part of some methods that were used in our research, meaning human error is prevalent
- ❑ The methods all have similar results, meaning the most efficient path depends on what the objective of the situation is
- ❑ The autonomous methods rely on the presence of obstacles; thus, they may become inefficient in wider spaces

ACKNOWLEDGMENTS

We appreciate the opportunity provided to us by Oak Ridge National Laboratory, Oak Ridge Associated Universities and the Appalachian Regional Commission. Additional thanks to Adam Carroll, Curt Holmes, and Andy Rayfield for their valuable instruction and guidance throughout this project.