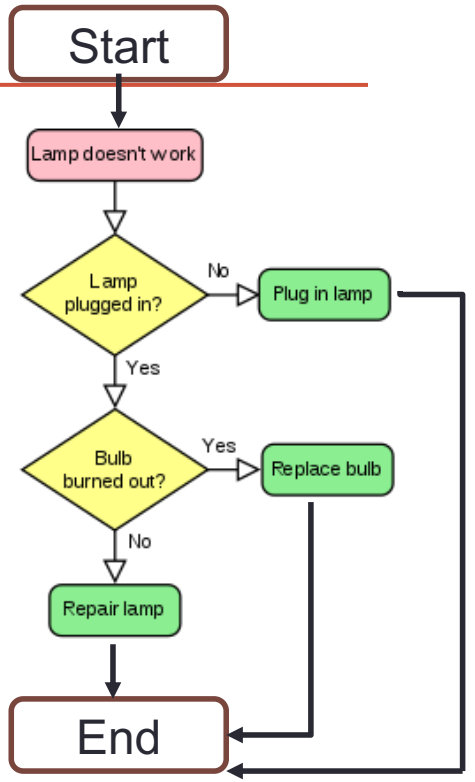
CISC 1003 - EXPLORING ROBOTICS

FLOWCHARTS


Start
Lamp doesn't work
Lamp plugged in?
No
Plug in lamp
Yes
Bulb burned out?
Yes
Replace bulb
No
Repair lamp
End

Flowcharting

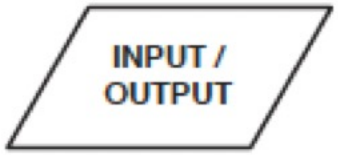
- The four common symbols used in flowcharting are:
  - Start and Stop
  - Input and output
  - Decisions
  - Process

Flowcharting

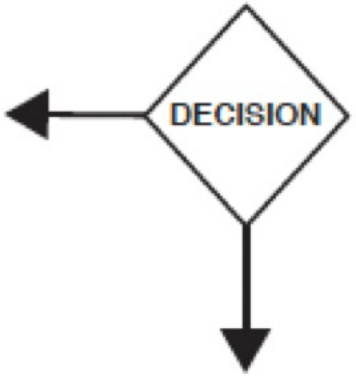
- Start and stop:

  - The start symbol represents the beginning of the flowchart
    - with the label “start” appearing inside the symbol.
  - The stop symbol represents the end of the flowchart
    - with the label “stop” appearing inside the symbol.
  - These are the only symbols with keyword labels.

Flowcharting

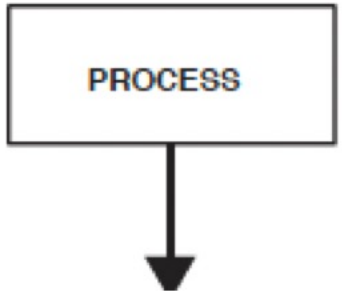


- Input and output:
  - The input and output symbol contains data that is used for input (e.g., provided by the user)
    - and data that is the result of processing (output)
- Decisions:
  - The decision symbol contains a question or a decision that has to be made.

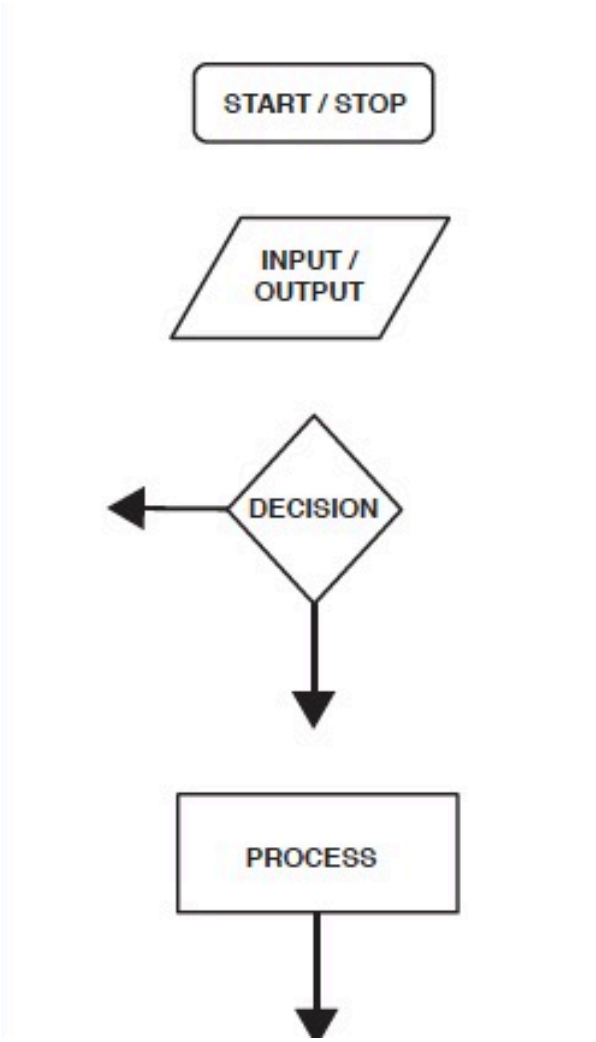


Flowcharting

- Process:
  - The process symbol contains brief descriptions (a few words) of a rule or some action taking place .



Common Flowchart Symbols



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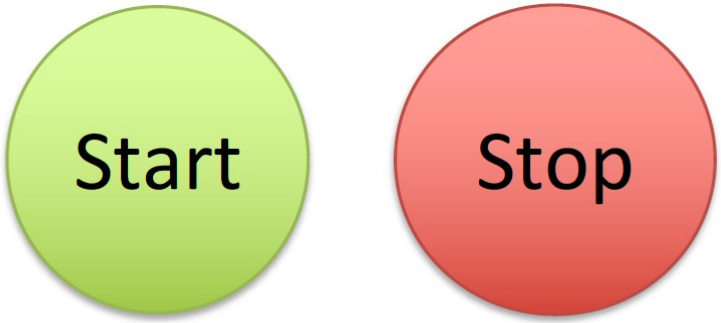
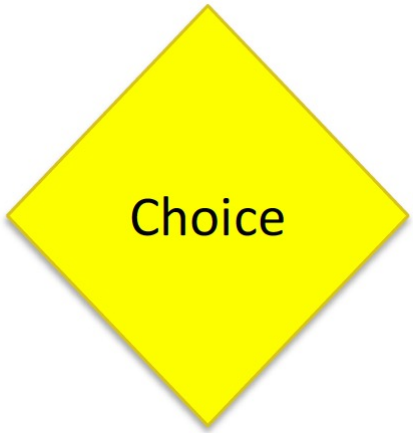
Flowcharts have a standard set of shapes and colors that are universally used so that everyone can understand what they mean.



The start and the stop shapes show where the program starts and stops



Yellow diamonds represent a choice or decision based on a question. This must be at least a yes/no decision.

These rectangular blocks represent actions in the program

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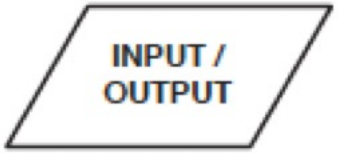
Flowcharting



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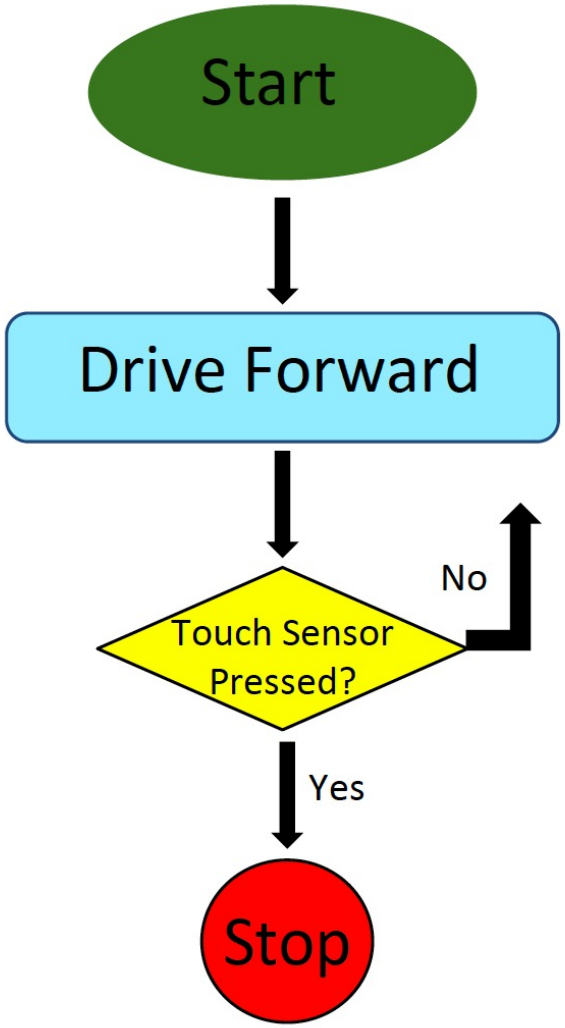
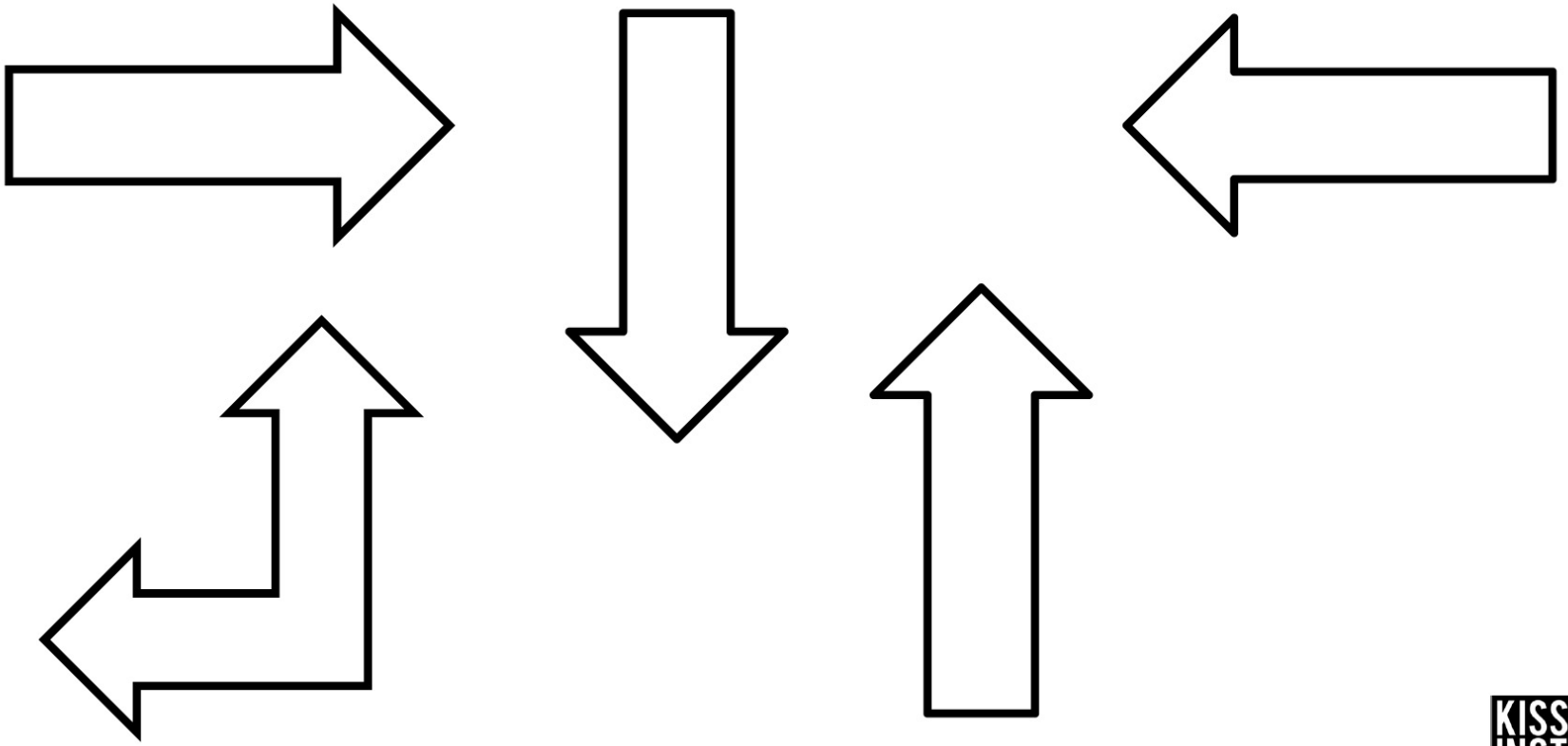

Start
Drive Forward
Touch Sensor Pressed?
No
Yes
Stop

Arrows are used in flowcharts to show the direction, or flow, of the program.



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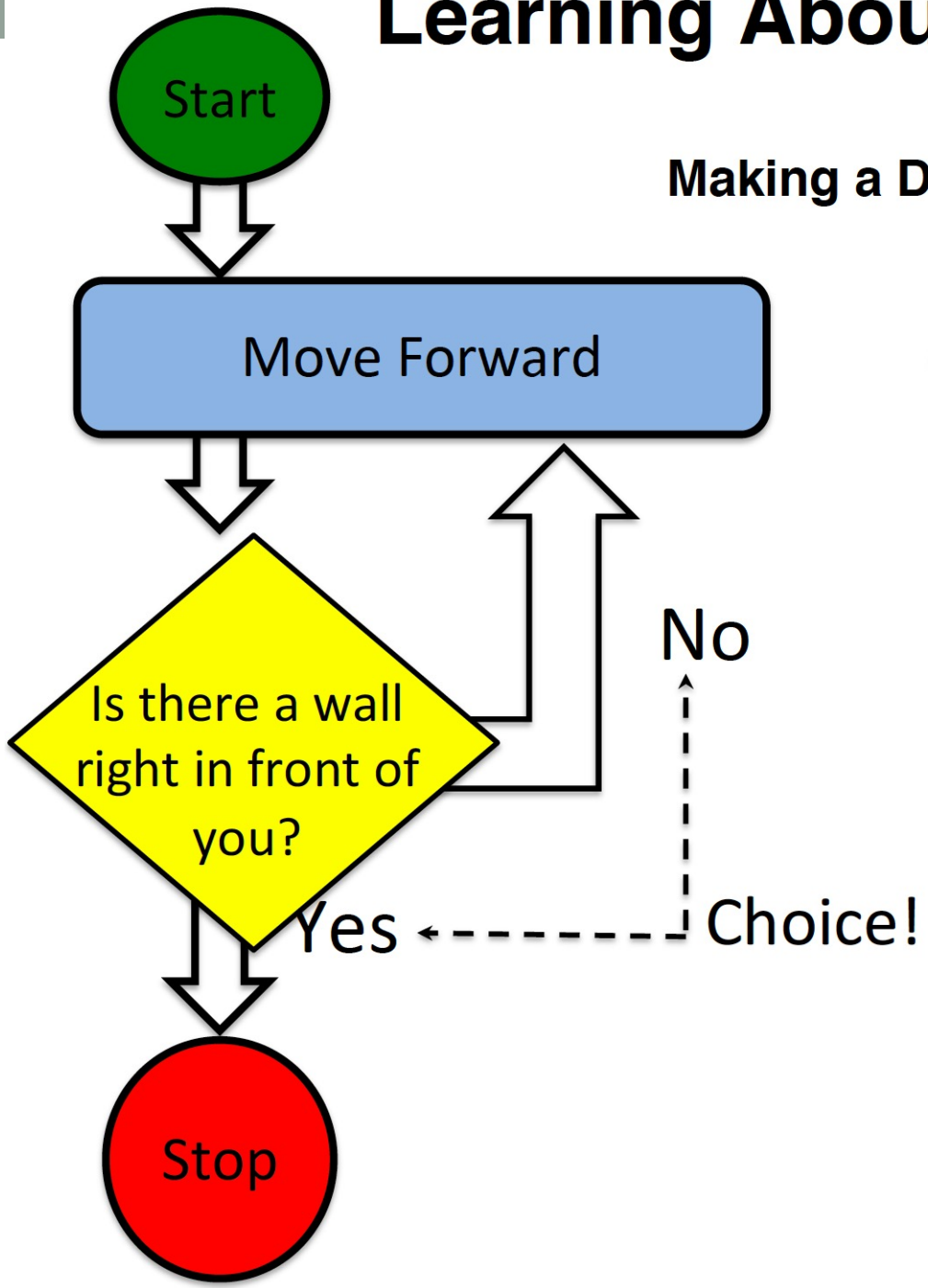
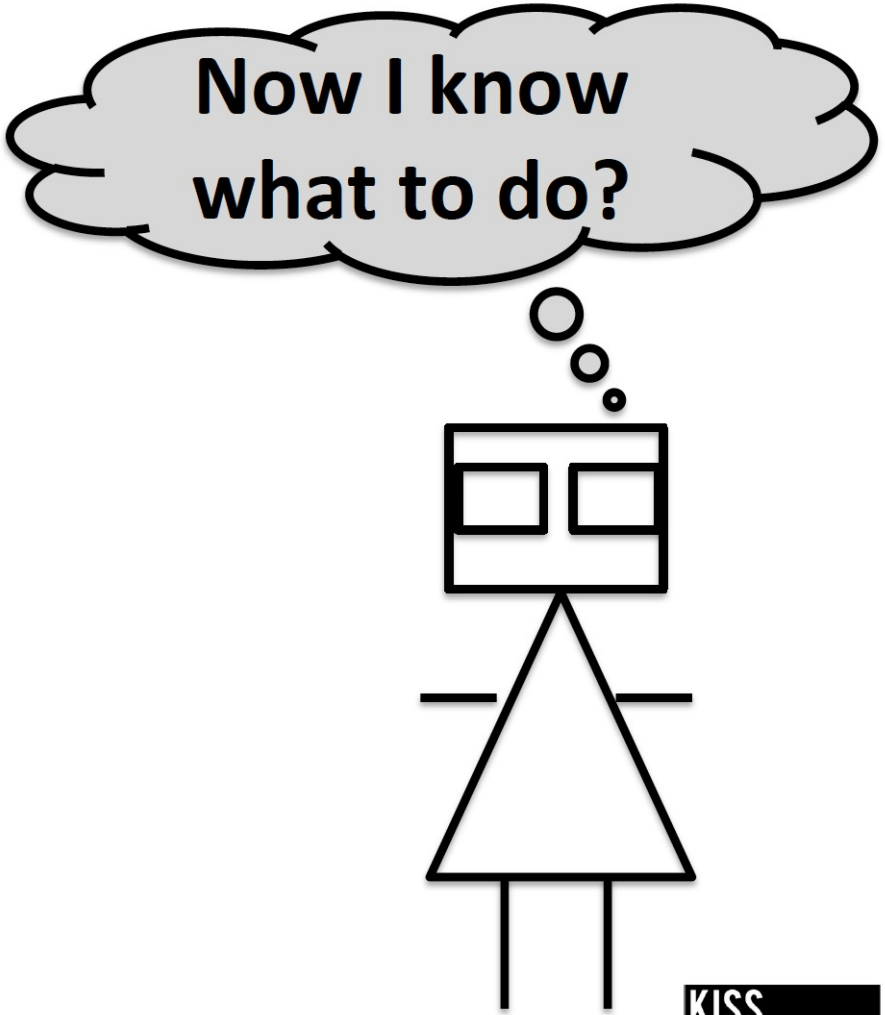
Learning About Flowcharts



Making a Decision:



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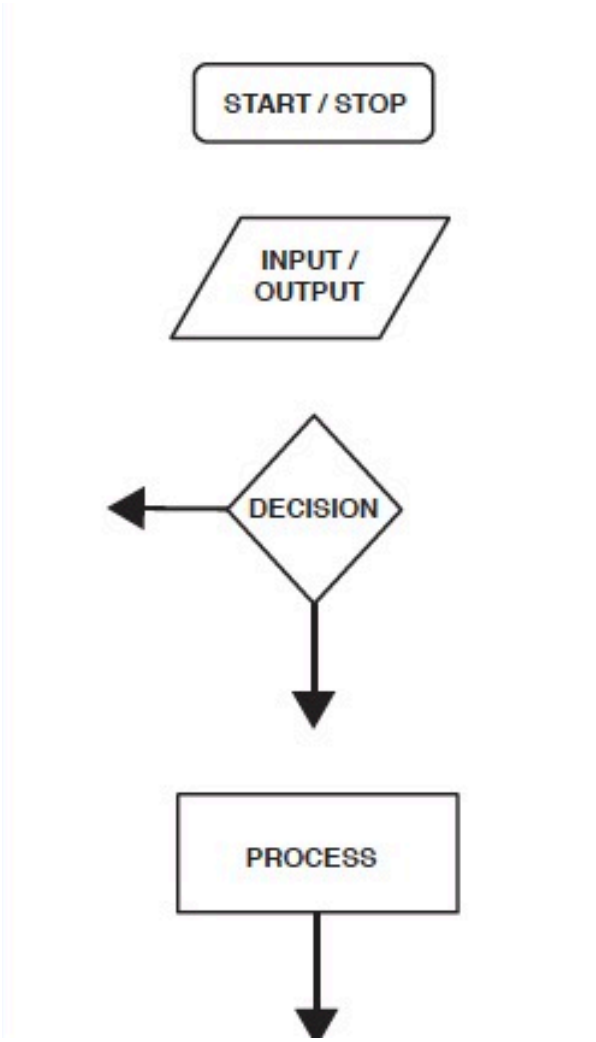
Common Flowchart Symbols



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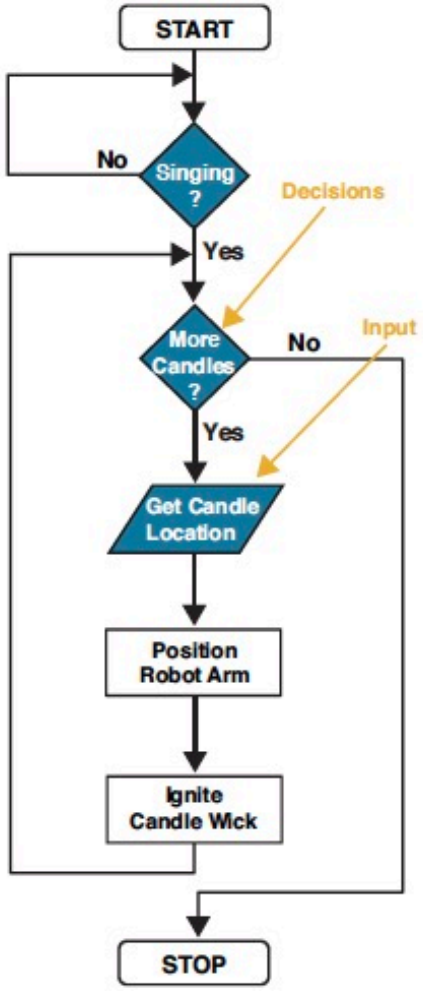
Example - Candlelighting Flowchart



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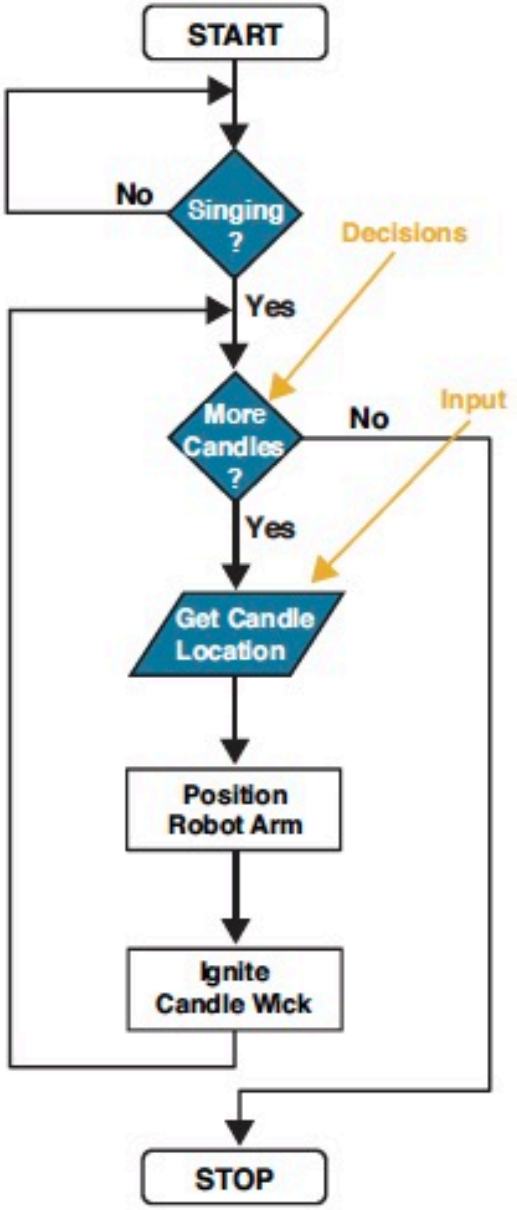

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Flowcharting

- The task a robot executes can be a series of steps performed one after another
  - a sequential flow of control.
- ***Flow of control*** details the direction the process takes
  - which way program control “flows
- Flow of control determines how a computer responds
  - when given certain conditions and parameters

Example: Sequential Flowchart

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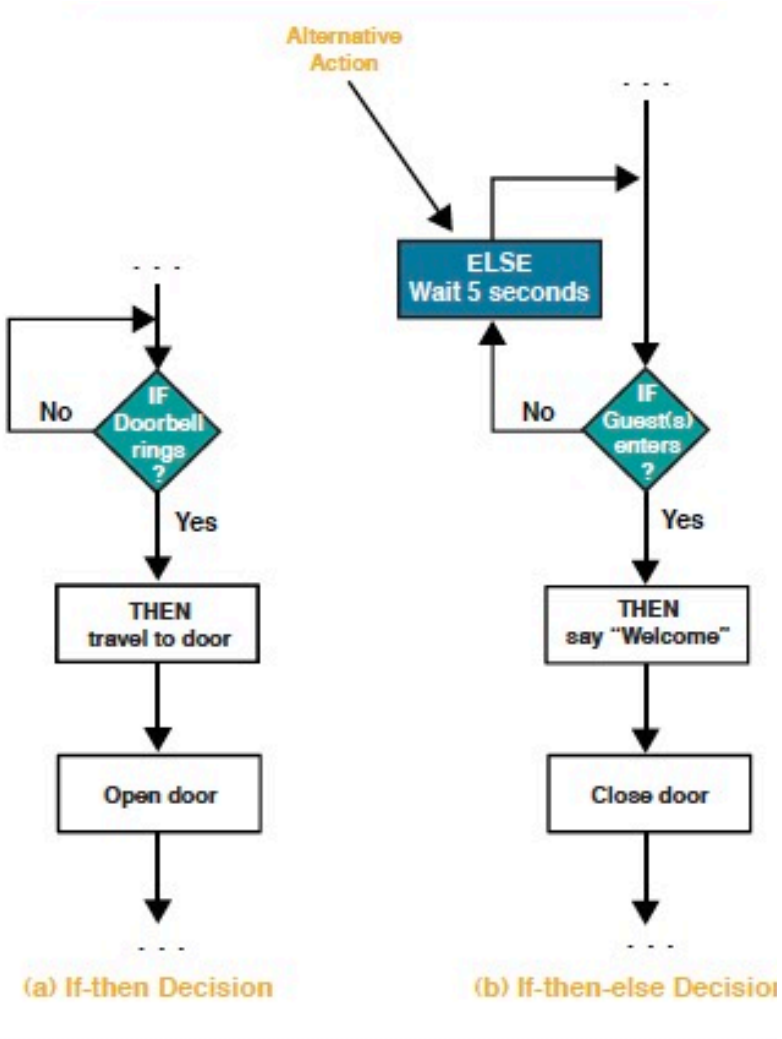
Flowcharting

- A decision symbol is used to construct branching for alternative flow controls.
- Decision symbols can be used to express decision, repetition, and case statements
- A simple decision is structured as an if-then or if-then-else statement

Example – Guest Welcoming Flowchart



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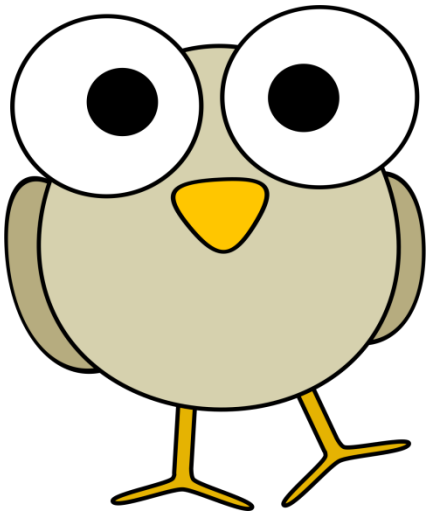
Summary

- The RSVP is composed of three types of visuals:
  - A floorplan of the physical environment of the scenario
  - A statechart of the robot and object's states
  - Flowcharts of the instructions for the tasks
- These visuals ensure that you have a "clear picture" of what has to be done
  - to program a robot to save the world
    - or light the candles on a cake

- Questions?



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Flowcharts

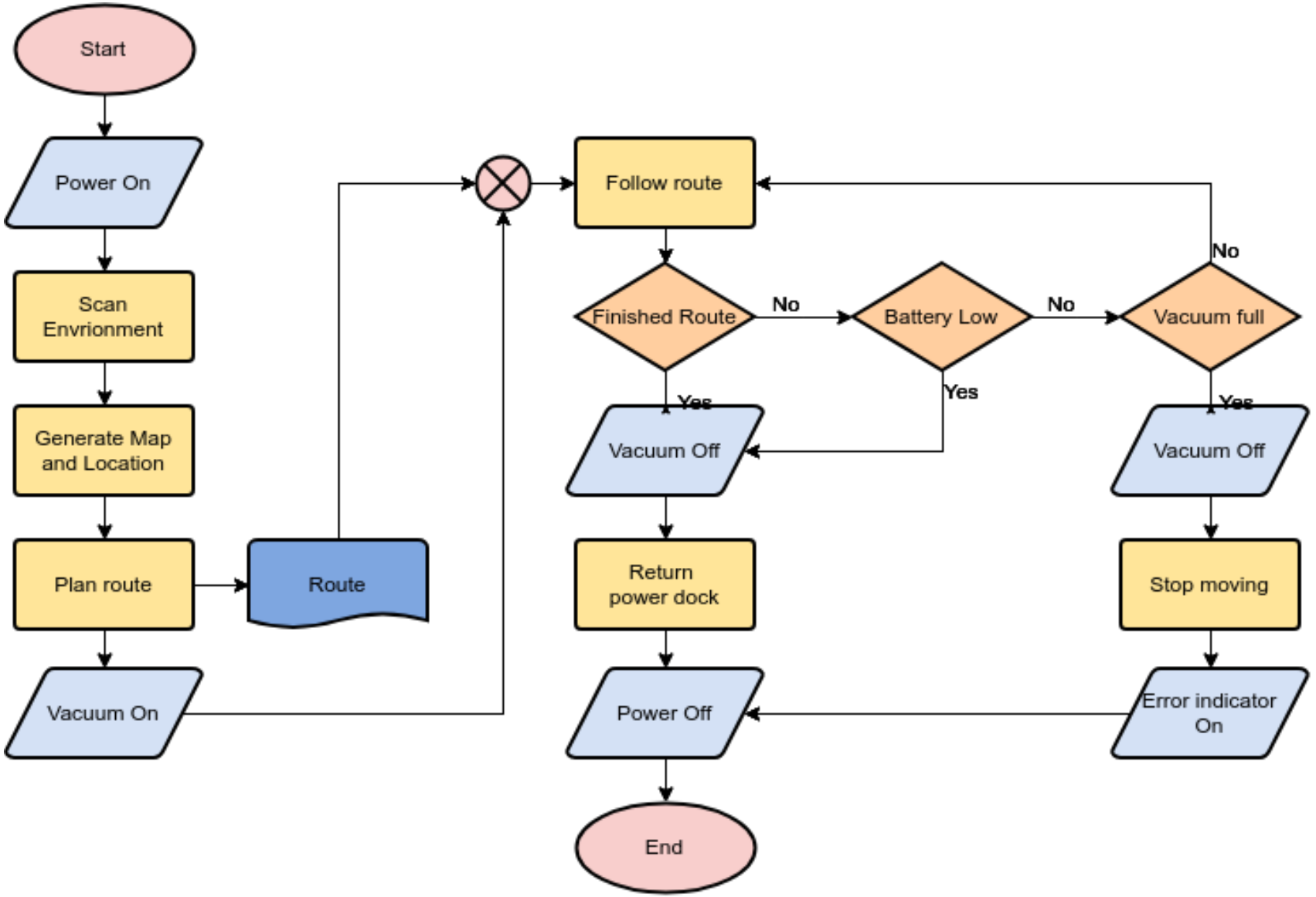
- https://www.youtube.com/watch?v=kxZJv56BxU8

Flowcharts

- The friendship algorithm

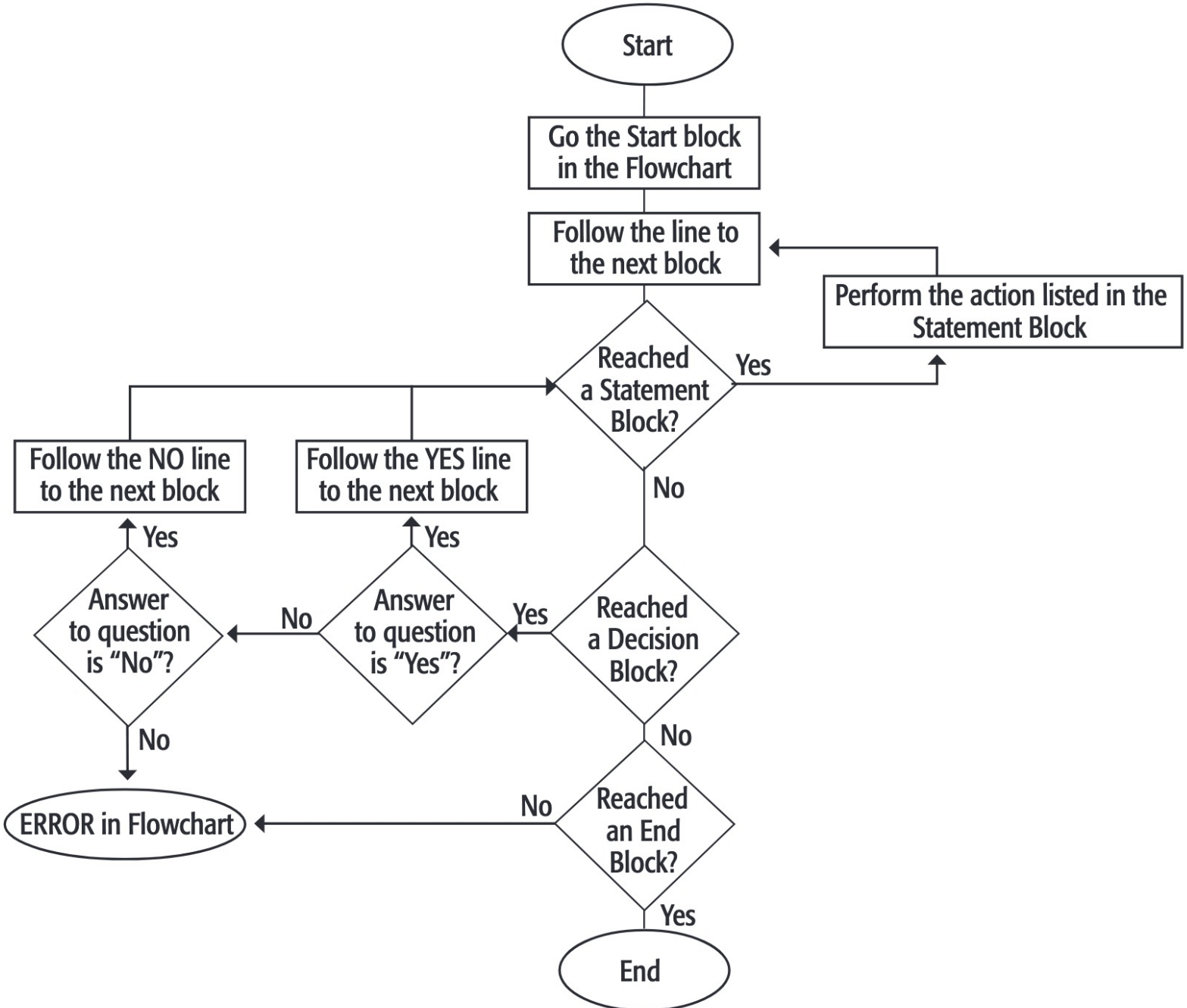
FLOWCHARTS

Vacuum Robot Flowchart Example



Flowchart Example

- How to read flow charts


Start
Go the Start block in the Flowchart
Follow the line to the next block
Perform the action listed in the Statement Block
Reached a Statement Block?
Yes
No
Follow the NO line to the next block
Follow the YES line to the next block
Yes
Yes
Answer to question is "No"?
Answer to question is "Yes"?
Reached a Decision Block?
No
Yes
No
No
ERROR in Flowchart
Reached an End Block?
No
Yes
End

EXERCISES

Flowchart Exercise 1

- Robot moves forward as long as its touch sensor is not pressed
  - When the touch sensor is pressed the motors stop and the program ends
- How would you create a flowchart for this program?

Flowchart Exercise 2

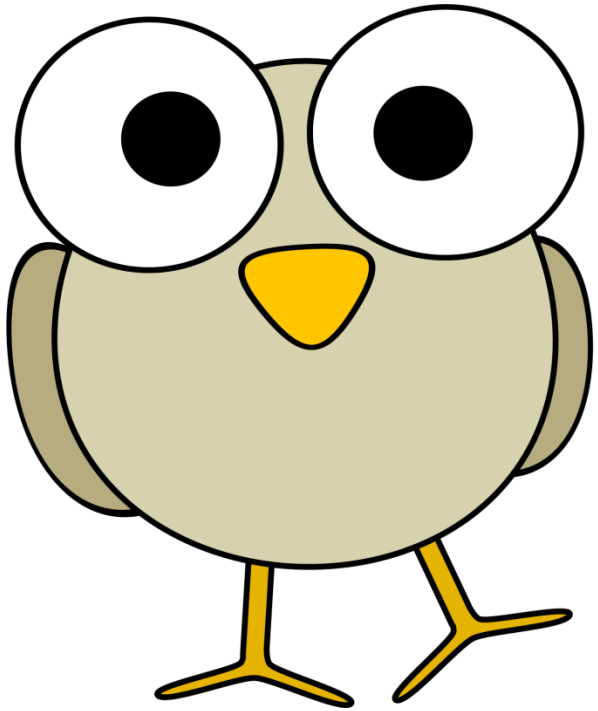
- If it’s raining, bring an umbrella

Flowchart Exercise 3

- Go forward until the Touch Sensor (on port 1) is pressed in, then stop

Flowchart Exercise 4

- Turn on oven. Cook turkey for 4 hours or until meat thermometer reaches 180 degrees



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