Using Flowcharts for Algorithms

John R. Wright, Jr., PhD, CSTM, CLSSGB, CSCE, F.ATMAE
AENG 467, Mobile Robotics
Millersville University
Algorithms, Pseudocode & Code

• An Algorithm is your plan/idea (how to solve a problem)
  • May be expressed in many different ways
    • Mathematical Expression
    • Pseudo Code (written text)
• Pseudocode is the written expression of the Algorithm
  • It is simply a description on how your program should work in plain English or another language
• Code – this is what you program (Syntax) to enact your algorithms
• Other notes:
  • Some people are great at code
  • Some are great at developing algorithms
    • Innovation really comes from great algorithms!
    • Optimization comes from great code!
Flowcharting

- Flowcharts allow one to see a pictorial representation of the process.
- They make it easier to understand the process at hand!
- MS Visio is a great tool for developing flowcharts as you can easily drag and drop the symbols.
Flowchart Symbols

- **Terminator**: Indicates the beginning or end of a program flow in your diagram.
- **Process**: Indicates any processing function.
- **Decision**: Indicates a decision point between two or more paths in a flowchart.
- **Delay**: Indicates a delay in the process.
- **Data**: Can represent any type of data in a flowchart.
- **Document**: Indicates data that can be read by people, such as printed output.
- **Multiple documents**: Indicates multiple documents.
- **Subroutine**: Indicates a predefined (named) process, such as a subroutine or a module.
- **Preparation**: Indicates a modification to a process, such as setting a switch or initializing a routine.
- **Display**: Indicates data that is displayed for people to read, such as data on a monitor or projector screen.
- **Manual input**: Indicates any operation that is performed manually (by a person).
- **Manual loop**: Indicates a sequence of commands that will continue to repeat until stopped manually.
- **Loop limit**: Indicates the start of a loop. Flip the shape vertically to indicate the end of a loop.
- **Stored data**: Indicates any type of stored data.
- **Connector**: Indicates an inspection point.
- **Off-page connector**: Use this shape to create a cross-reference and hyperlink from a process on one page to a process on another page.
- **Collate**: Indicates a step that organizes data into a standard format.
- **Sort**: Indicates a step that organizes items list sequentially.
- **Merge**: Indicates a step that combines multiple sets into one.
- **Database**: Indicates a list of information with a standard structure that allows for searching and sorting.
- **Internal storage**: Indicates an internal storage device.

Visio Basic Flowchart Shapes
MS Visio Basic Flowchart Example

http://www.sawyoo.com/postpic/2015/03/visio-flowchart-shapes_206705.png
Smartdraw Flowchart Example

Patient arrives

Patient in the system? (Yes/No)

No

Patient needs to complete paperwork

Yes

Nurse available? (Yes/No)

No

Waiting Room

Yes

Take pulse, blood pressure, weight, urine

Doctor available? (Yes/No)

No

Waiting Room

Yes

Patient with doctor

Need follow-up appointment? (Yes/No)

No

Make an appointment

Yes

Need medication? (Yes/No)

No

Patient sent to pharmacy

Dispense medication

Patient leaves

start/end

Medical Services

decision

process
Microsoft Word Process Flowchart Template Example

[Flowchart Image]

Identifying Staffing Needs
  Define and write up job description
  Send personnel request from to HR
  Determine classification
  Regular Hire?
  Temp Hiring Process

Post job internally
  Suitable Candidate?
  Yes
  No

Examine existing resumes on file
  Yes
  No

Arrange meeting with candidate
  Conduct preliminary interview
  Develop interview questions
  Conduct interview
  Select Candidate
  Determine Pay range
  Make employment offer
  Candidate accepts?
  Yes
  No
  No

Gather Resumes
  References OK?
  Yes
  No
  No

Resume Qualified?
  Yes
  No

Hire Candidate

Flowcharting Resources

• MS Visio 2016 Tutorial
  • https://www.youtube.com/watch?v=b09dKHvu4-4
Common Errors

• Arrows / Flow issues
  • Missing
  • Direction
  • Decision Symbols

• Incorrect Symbol usage
  • Documentation vs Process
    • Think of documentation as a special type of process that has a special symbol
  • Decision
    • Label them
    • Cleaner to use one line per joint
  • Subprocess vs Process
    • Subprocess symbols will require another flowchart

• Continuation References
  • On or off page symbols
Oh, What is a Flowchart?

- https://www.youtube.com/watch?v=2rZY8iX8Mdw