Program Design
ENGR 1181
MATLAB 01
Program Design in Real Life

Complex manufacturing processes require careful logic mapping to determine what actions should be taken and when to produce a product. Often in automotive manufacturing, the control of robots is carefully planned and timed with flowcharts at each stage of the welding process.
Today's Learning Objectives

- After today’s class, students will be able to:
  - Explain the significance of the planning stage in computer problem solving.
  - Develop algorithms to aid in the creation of computer code.
  - Construct flow charts to develop code.
Why Computer Problem Solving?

- Experience with open-ended problems
- Practice with problem solving
- Experience with method
- Learning an important engineering skill
Problem Solving

1. Define
2. Represent
3. Plan
4. Implement
5. Evaluate
Algorithms

- Algorithms are a step by step plan
- Consider every step that’s necessary to complete a task or solve a problem
- Useful tools for problem solving (DR. PIE!)
- They will make programming easier and less time consuming 😊
Algorithm Exercise

- You will work with your classmates to finalize a step-by-step procedure to solve a problem or complete a task.

- Discuss amongst your teammates the various algorithms each person created.

- Select the algorithm that will best complete the task and modify the algorithm if needed.
  - Make sure you consider every small step or detail
  - You will need to make many assumptions
Algorithm Example

The Task: Have a person fill a bottle with stones.

- Start by listing assumptions
  - A bottle is present
  - Stones are present
  - ...
  - ...
  - ...
Algorithm Example

- Trade the finalized algorithm with another team
- Follow their directions EXACTLY
- Document how well it works!
Algorithm Example

- How did things go?
- Anything left out or overlooked?
  - Assumptions
  - Steps
  - Order
Algorithm Example

1. Set bottle upright near stones.
2. If bottle is closed, open it.
3. If bottle is full, go to #7.
4. Select a stone and try to place it in the bottle
5. If stone is too large, discard stone and go to #3
6. Place stone in bottle and go to #3
7. Stop
Structured Problem Solving

- Top-down, step-wise refinement
  - Start big.
  - Determine subtasks and order
  - Continue until you can’t get any smaller

- Pseudo Code
  - Informal
  - Programming “light”
Structured Problem Solving

- Flowcharts
  - Develop, not document
  - High-level
  - Executable only
  - Coding guideline
  - Specifics not included

- Symbols

- Combine with algorithm
Flowchart Example

- Flowcharts help us visualize our algorithm/program
- DR. PIE: Represent
- It’s good practice to make a flowchart before writing any program. It will save you lots of time!
Flowchart Example

- Friendship Algorithm
Flowchart Example

THE FRIENDSHIP ALGORITHM
DR. SHELDON COOPER, PH.D.

PLACE PHONE CALL

HOME

LEAVE MESSAGE

WAIT FOR CALLBACK

WHAT IS THE BIG BANG THEORY?

DO YOU KNOW IT?

WE MAKE A PLAN

WE WORK TOGETHER

DO WE HAVE INTEGRITY?

DO WE HAVE SIMILAR THOUGHTS?

DO WE HAVE SIMILAR INTERESTS?

DO WE HAVE MATCHING INTERESTS?

DO WE HAVE MATCHING ATTITUDES?

DO WE HAVE MATCHING ETHICS?

DO WE HAVE MATCHING VIEWS ON LIFE?

DO WE HAVE MATCHING VIEWS ON RELIGION?

DO WE HAVE MATCHING VIEWS ON POLITICS?

DO WE HAVE MATCHING VIEWS ON FOOD?

DO WE HAVE MATCHING VIEWS ON MUSIC?

DO WE HAVE MATCHING VIEWS ON MOVIES?

DO WE HAVE MATCHING VIEWS ON SPORTS?

DO WE HAVE MATCHING VIEWS ON TRAVEL?

DO WE HAVE MATCHING VIEWS ON ART?

DO WE HAVE MATCHING VIEWS ON CULTURE?

DO WE HAVE MATCHING VIEWS ON EDUCATION?

DO WE HAVE MATCHING VIEWS ON SCIENCE?

DO WE HAVE MATCHING VIEWS ON TECHNOLOGY?

DO WE HAVE MATCHING VIEWS ON PHILOSOPHY?

DO WE HAVE MATCHING VIEWS ON RELATIONSHIP?

DO WE HAVE MATCHING VIEWS ON FAMILY?

DO WE HAVE MATCHING VIEWS ON FRIENDSHIP?

DO WE HAVE MATCHING VIEWS ON WEALTH?

DO WE HAVE MATCHING VIEWS ON HEALTH?

DO WE HAVE MATCHING VIEWS ON VISION?

DO WE HAVE MATCHING VIEWS ON MISSION?

DO WE HAVE MATCHING VIEWS ON GOALS?

DO WE HAVE MATCHING VIEWS ON STRATEGIES?

DO WE HAVE MATCHING VIEWS ON OPERATIONS?

DO WE HAVE MATCHING VIEWS ON IMPLEMENTATION?

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DO WE HAVE MATCHING VIEWS ON IMPLEMENTATION?
Important Takeaways

- Programs require logic and information
  - Flowcharts map this flow and set the foundation for an efficient program

- Machines don’t know anything unless they are told exactly what’s needed
  - Think like a machine when programming!
  - Ex: Machines don’t know a bottle is upright.
What’s Next?

- Start working on MAT-01 homework.
- Introduction to MATLAB
  - Students will be exposed to the basic set-up and functionality of MATLAB.
  - Complete the pre-class reading and take the Carmen quiz before coming to class.