What is a Program?
- A precise set of instructions
- Like the rules for a game, or how to build something, or directions to your house
- Can someone give me the directions to their house?

Directions to my house
- Go to the UCSC campus entrance at Bay and High.
- Enter the campus.
- At the first chance to turn left, turn right.
- Turn right at the next intersection.
- Immediately go left.
- Park near the playground.

Tic-Tac-Toe
- Draw a big #
- First player draws an X in one square.
- Second player draws an O in some square.
- Continue until someone has three letters in a row or diagonal, or all the squares are filled.

What can computers understand?
- A computer probably couldn’t follow the instructions we just gave for getting to someone’s house or playing tic-tac-toe.
- Different computers have different basic operations they can perform, like addition, subtraction, draw a line, etc.
- A Compiler converts our programs into the things a computer can understand.

Software Life Cycle
- Specify the requirements
- Analyze the requirements
- Design the algorithm (solution)
- Implement the algorithm as a program
- Test and verify
- Maintain and update

Fetch the newspaper: Specification
Starting from a known home position, move outside, locate the newspaper, and bring it to the kitchen table (another known location), then return to the home position.
**Fetch the newspaper: Analysis**

**Input:** Layout of the house, especially the location of the front door, the table, and the home location.

**Output:** Servo commands to move the robot, pick up the paper etc.

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**Fetch the newspaper: Design**

- Go outside
- pick up the paper
- go inside
- put the paper on the table
- return to home position

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**revised design - pseudocode**

- go to the front door
- open the door
- go through the doorway
- close the door
- locate the newspaper
- if found pick it up, else signal an error
- go to the front door
- open the door
- go through the doorway
- close the door
- go to the table
- if no error then release the newspaper
- go to the home position

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**// actual Java code**

```java
public class GetPaper extends Jarel {
    public void run() {
        goOutside();
        findPaper();
        goInside();
        findTable();
        drop(); // put paper on table
        goToYourRoom();
    }
    void goInside() {
        move(2);
    }
}
```

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**Meet Jarel**

- What can Jarel Do?
  - Move
  - turnRight
  - pickup
  - drop
  - clearAhead
  - getBeeperCount