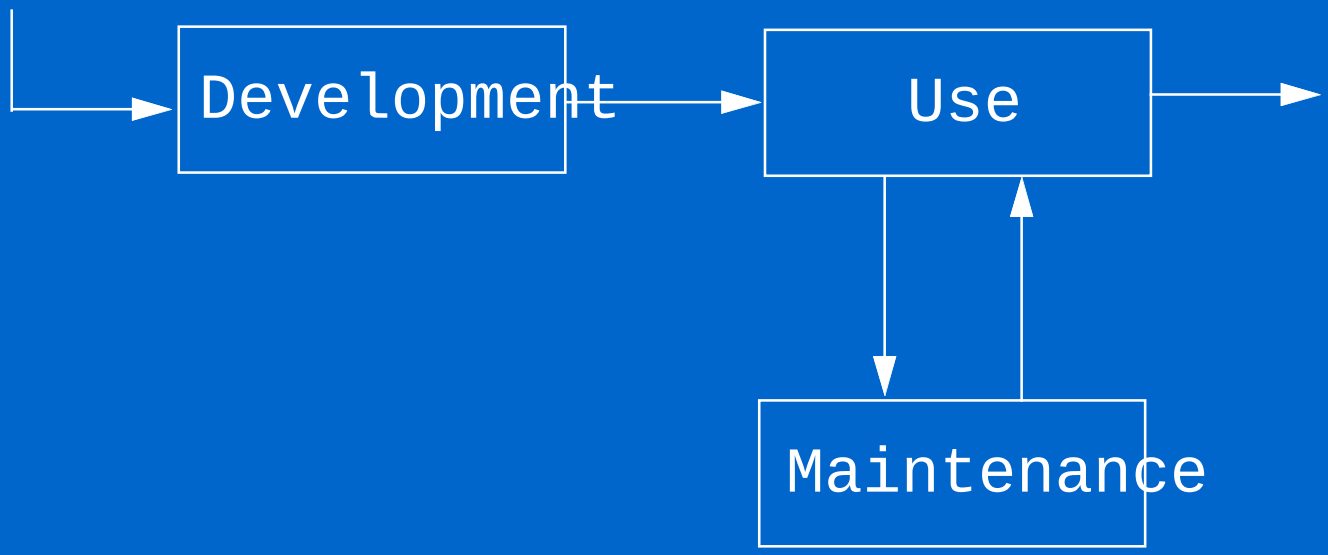
The Software Development Process -- I

- The quality of the software we create is a the process we follow to develop it
- Chapter 11 focuses on:
  - software life cycle
  - development models
  - prototypes
  - robot search problem

The Program Life Cycle

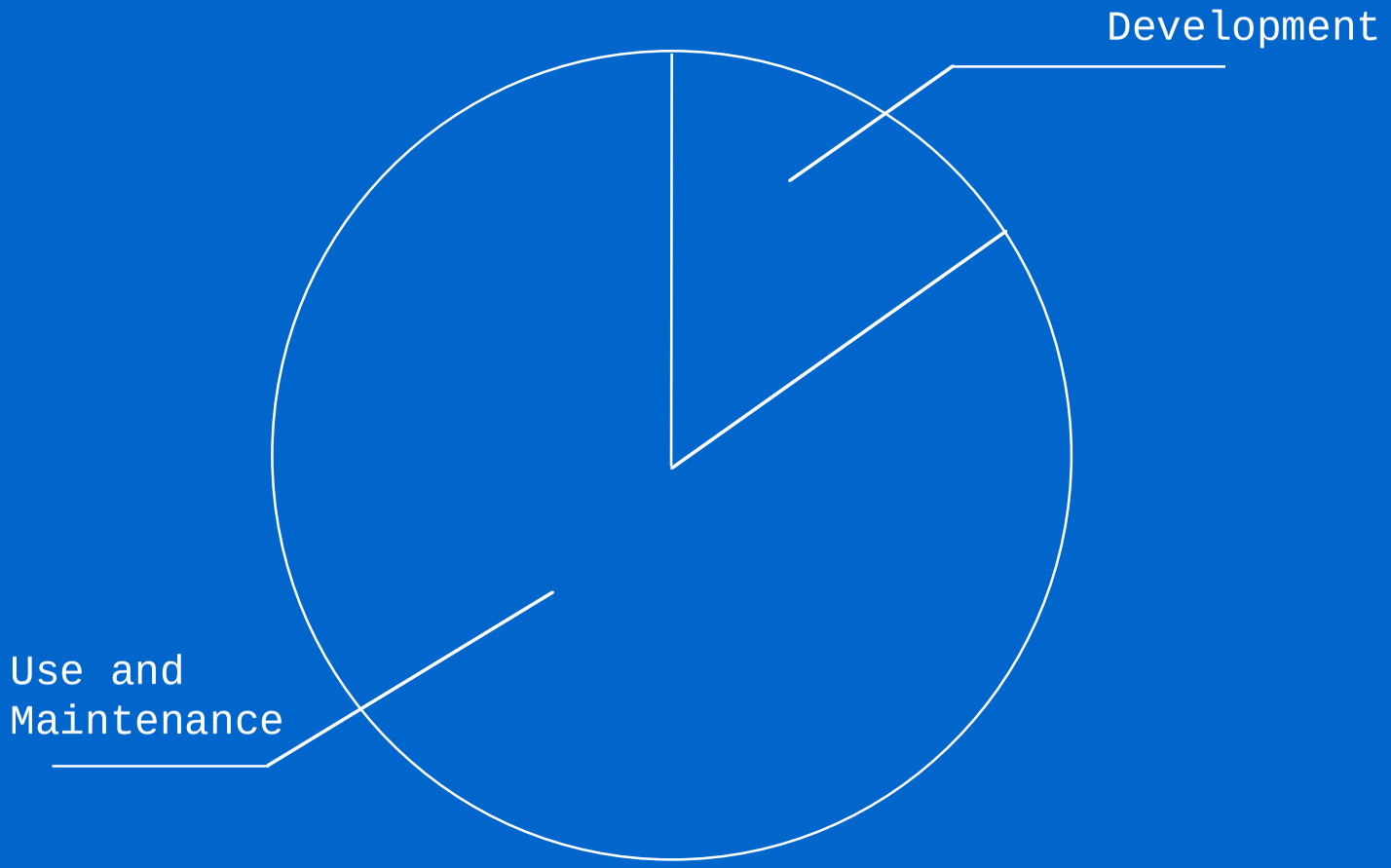
- The overall life of a program includes use maintenance:



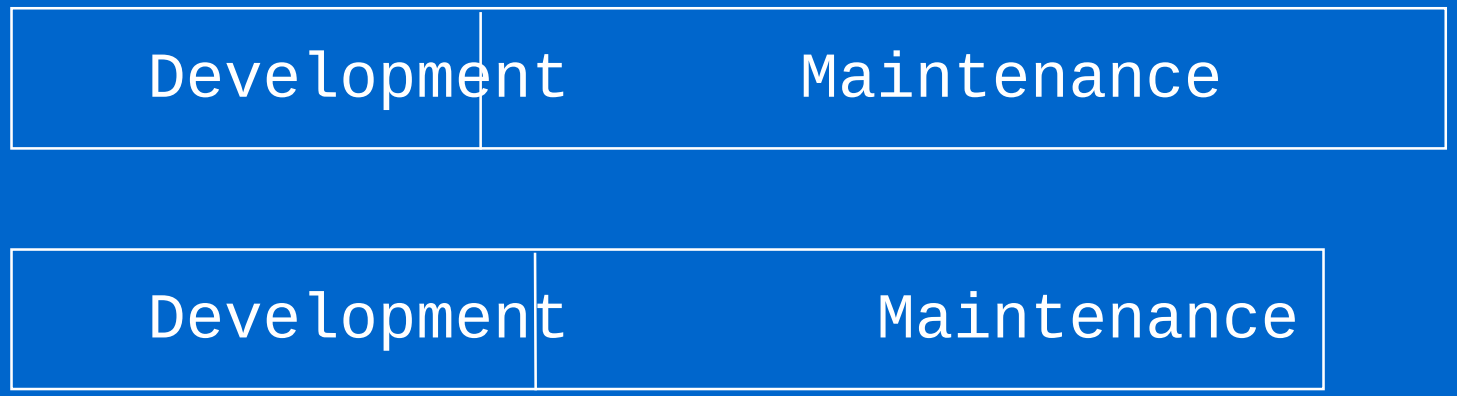
Maintenance

- Maintenance tasks include any modifications existing program
- It includes defect removal and enhancements
- The characteristics of a program that make develop also make it easy to maintain
- Maintenance efforts tend to far outweigh th development effort in today's software
- Small increases in effort at the developmen greatly reduce maintenance tasks

Development vs. Maintenance



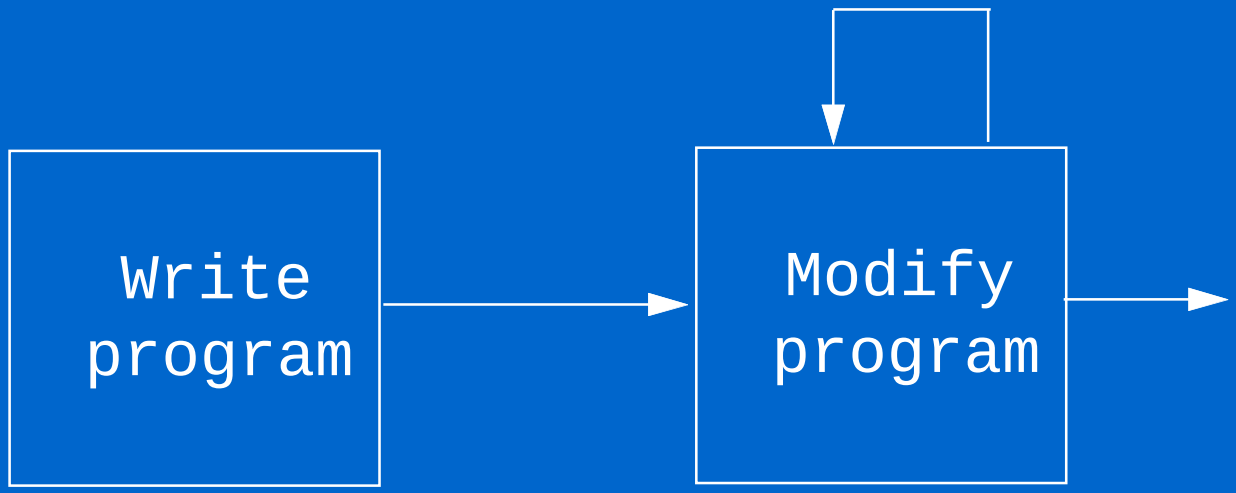
Development and Maintenance Effort



Development Process Models

- Too many programmers follow a build-and-fix approach
- They write a program and modify it until it without regard to system design
- Errors are haphazardly addressed as they ar
- It is not really a development model at all

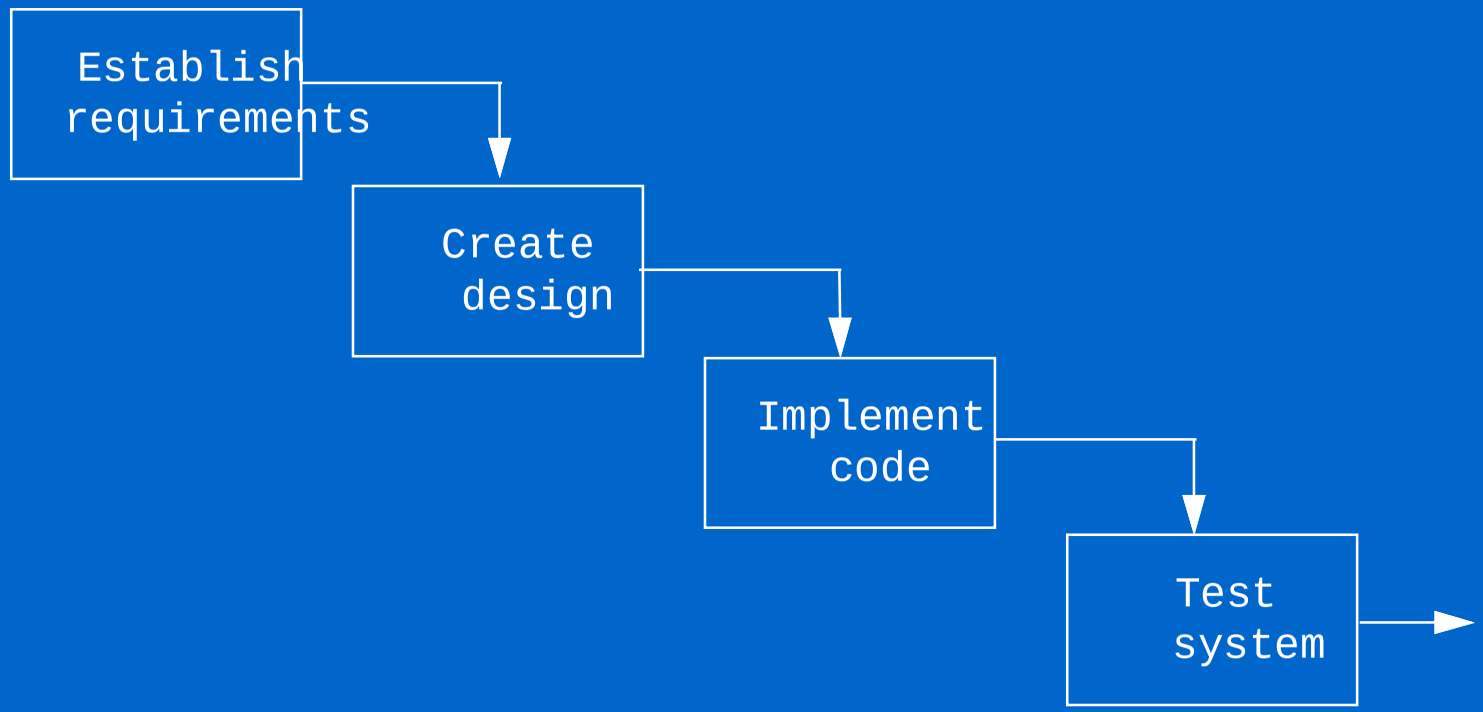
The Build-and-Fix Approach



The Waterfall Model

- Developed in the mid 1970s
- Activities that must be specifically addres development include:
  - Establishing clear and unambiguous requirements
  - Creating a clean design from the requirements
  - Implementing the design
  - Testing the implementation
- Originally it was proposed as a linear mode or no backtracking
- It is a nice goal, but unrealistic

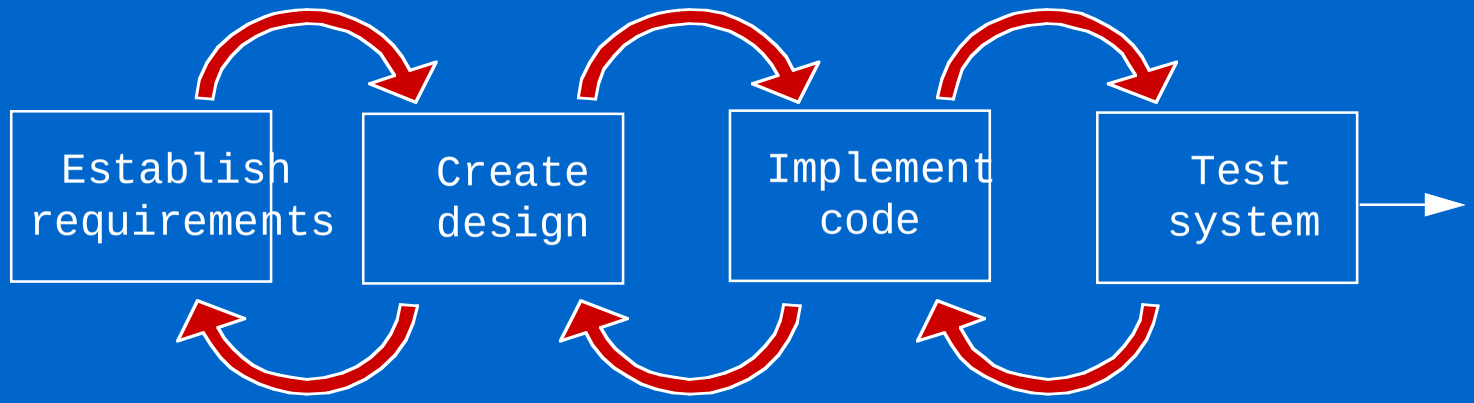
The Waterfall Model



An Iterative Process

- Allows the developer to cycle through the d development stages
- Essentially the waterfall model with backtr
- However backtracking should not be used as
- It should be used as a technique available developer in order to deal with unexpected may arise in later stages of development

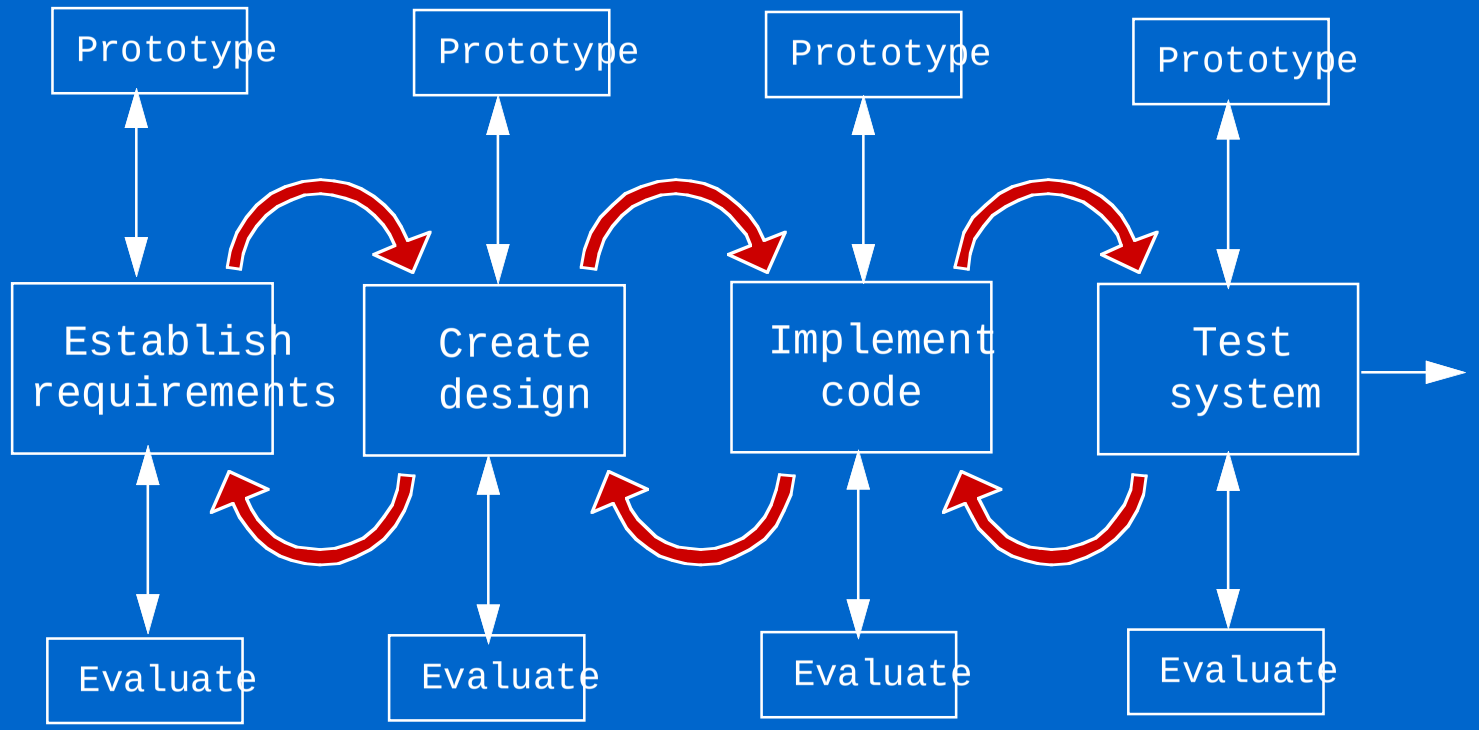
An Iterative Development Process



Prototype

- A program created to explore a particular c
- More useful, time-effective, and cost-effec merely acting on an assumption that may lat
- Usually created to communicate to the clien
  - a particular task
  - the feasibility of a requirement
  - a user interface
  -
- A way of validating requirements

An Enhanced Iterative Model



Evaluation

- The results of each stage should be evaluat prior to going on to the next stage
- Before moving on to the design, for example requirements should be evaluated to ensure completeness, consistency, and clarity
- A design evaluation should ensure that each was adequately addressed
- Prior to testing, the implementation should thoroughly code walkthrough

Testing Techniques

- Goal: to find errors
- Called defect testing
- A good test will uncover problems in a prog
- A test case includes
  - a set of inputs
  - user actions or other initial conditions
  - expected output
  -
- It is not feasible to exhaust every possibl

Black-Box Testing

- Mapping a set of specific inputs to a set o outputs
- An equivalence category is a collection of
- Two input sets belong to the same equivalen if there is no reason to believe that if on other will not
- Therefore testing one input set essentially category

White-Box Testing

- Also referred to as glass-box testing
- Focuses on the internal logic such as the i of a method
- Statement coverage guarantees that all stat method are executed
- Condition coverage guarantes that all paths method are executed

Robot Search Simulator

- We'll now explore a large example and follo the various development activities
- Robot Search Problem
  - a robot is sent into a hazardous area to find a t
  - we must develop a simulator to test its search al
  - the results will be shown graphically
  - walls and other barriers must be taken into accou

Robot Search Requirements

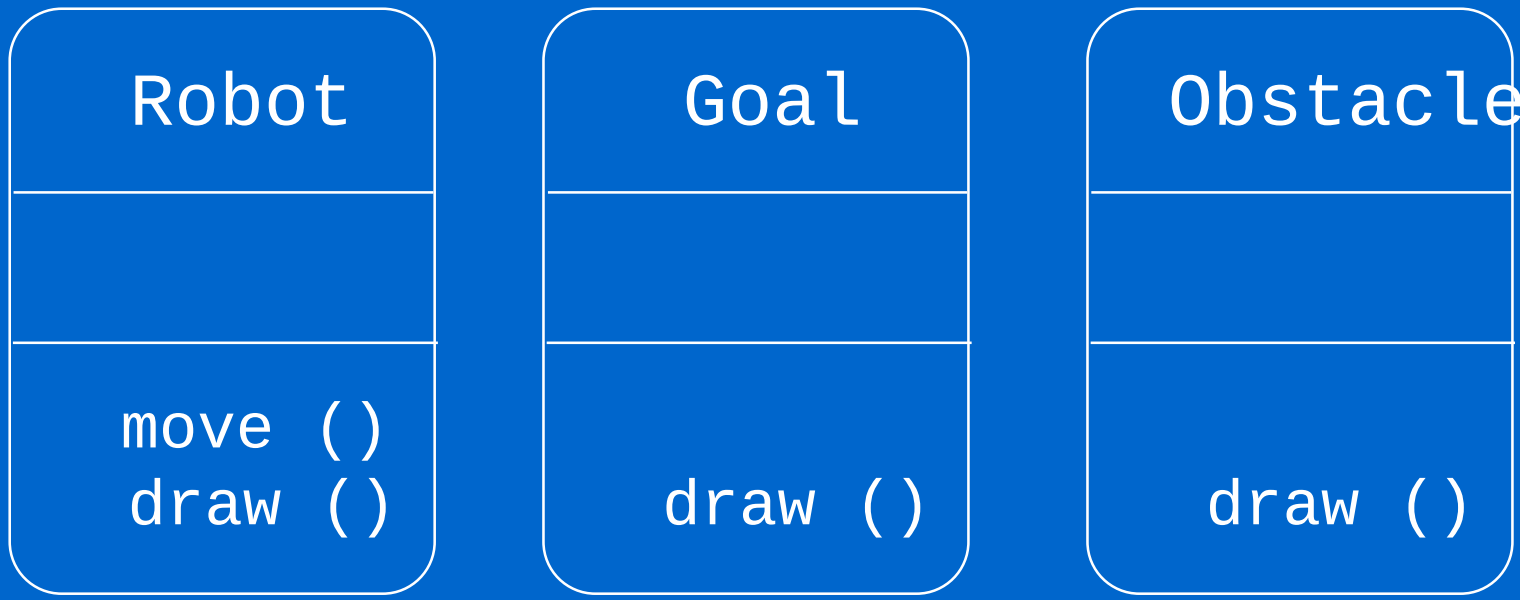
- The robotic engineers provide an initial se requirements
- The initial set are unclear and leave many unanswered
- The developers interview the engineers to r and create a new version of the requirement
- They are reviewed and critiqued

Robot Search Design

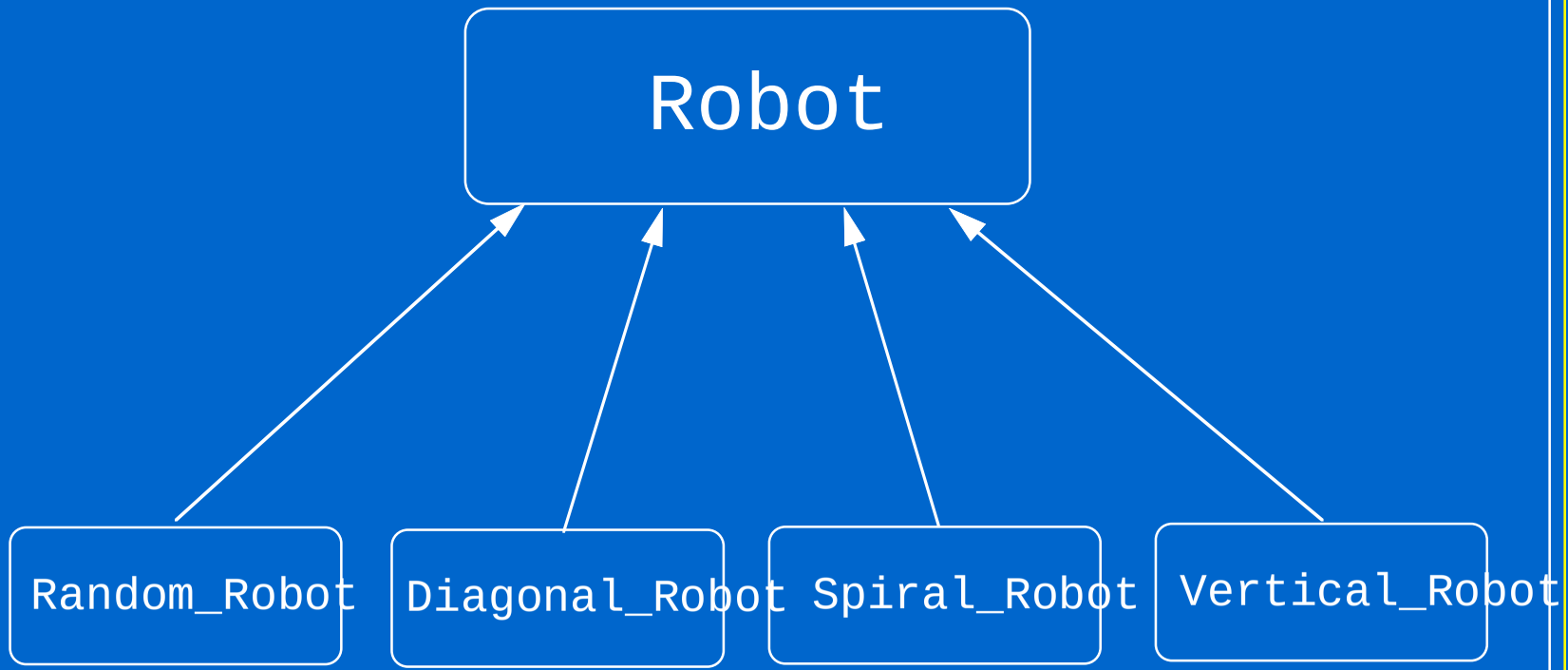
- The design itself should be an iterative pr
- An initial set of objects is chosen based o requirements
- As the design develops the apparent need fo objects arises
- Objects are abstracted into classes
- Focus is on the overall structure of the pr

Robot Search Design

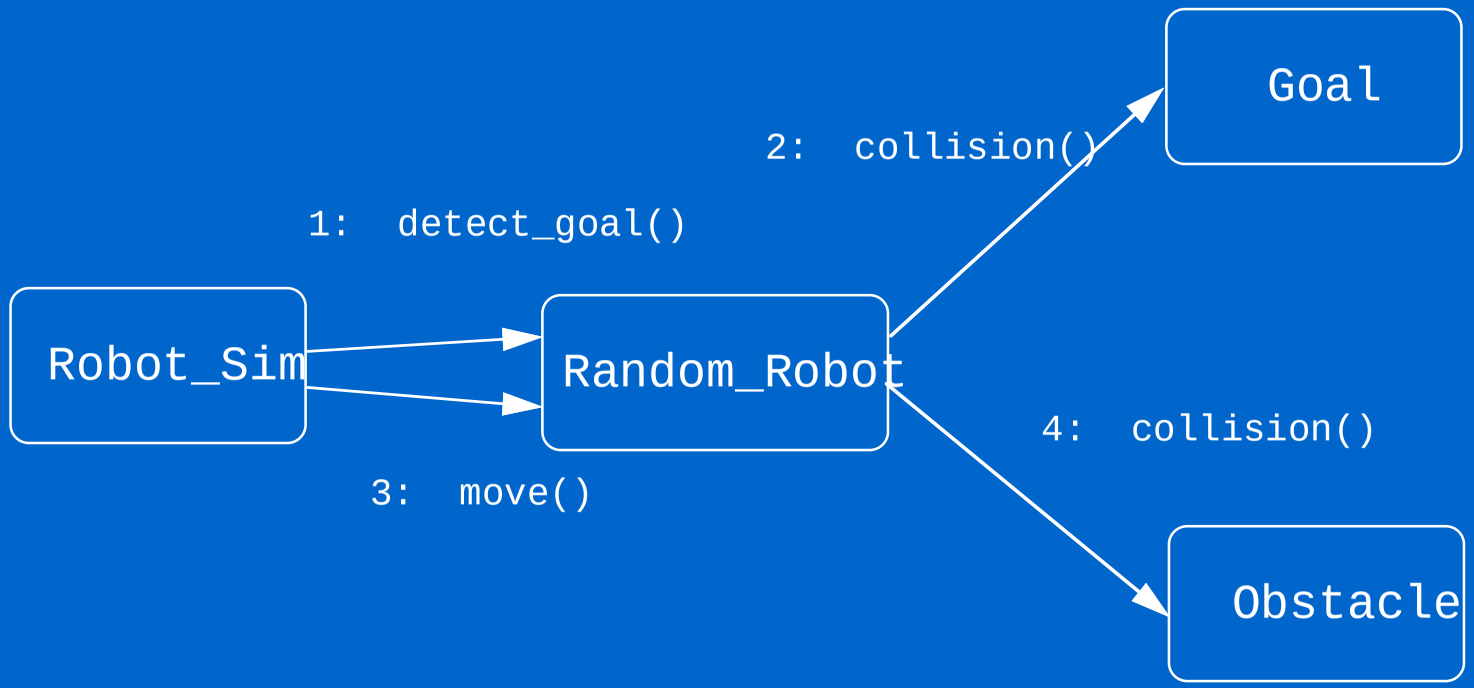
- Initial classes:



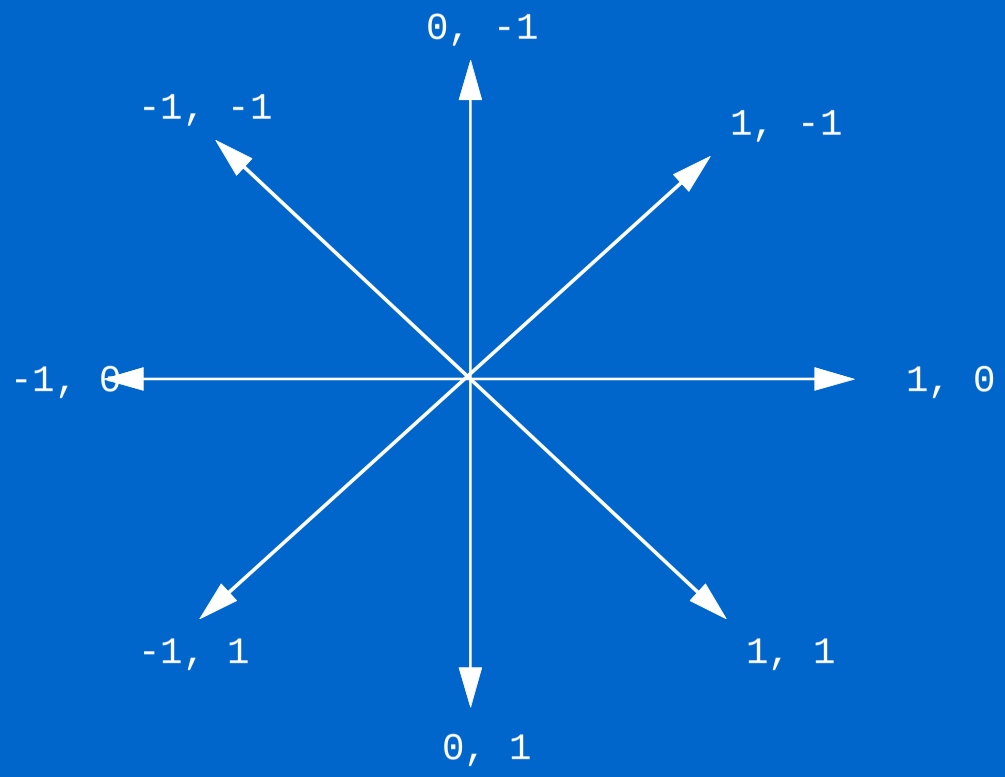
A Class Hierarchy for Robots



A Scenario Diagram



Changing Robot Position



Robot Search Design

- The developers have only limited knowledge processing
- A prototype is developed to:
  - load an image
  - move it across the screen
  - test animation speeds
  -
- This is called a proof-of-concept prototype developers continue with confidence
-

Robot Search Implementation

- The classes of the design are implemented i files:
  - Robot_Sim.java
  - Robot.java
  - Diagonal_Robot.java
  - Goal.java
  - Obstacle.java
  -
- Each one contains a particular class or cla

Collision Detection