Intro Karel J. Robot

- A suite of Java classes, with a graphical interface, used to illustrate concepts we will study in this course

- We will learn how to write instruction-sets (programs) so that our programmable robots can perform the tasks we give them
World Description

- A great, flat, plane with standard compass points
  - Bounded on west by infinite wall extending north
  - Bounded on south by infinite wall extending east

- Crisscrossing the world are horizontal streets and vertical avenues
  - A corner is an intersection of a street and avenue
  - One or more robots can occupy any corner, facing any direction
  - Both streets and avenues have numbers
  - Origin is where 1st St and 1st Ave intersect
  - Robots do not have to start from origin
  - Mnemonic: A of Avenue points north & V of Avenue points south
Robot World

- Beeper
- Robot
- Wall
- Avenue
- Street
- Corner
- Origin
  - 1st St.
  - 1st Ave.
World Objects

- **Wall Sections**
  - Positioned between adjacent street corners, blocking a robot’s direct path
  - Used to represent obstacles around which robots must navigate

- **Beepers**
  - Small plastic cones that emit a quiet beeping noise
  - Found on street corners; do not interfere with robot movement
  - Can be carried, picked up and put down by robots
  - There can be more than one beeper on a corner, and a robot can carry an infinite supply of beepers
  - Used to represent tasks for the robots to manipulate
Robot Behavior

- Robots can **move**
  - Forward in the direction it is facing, from corner to corner
  - Turn in place
  - Turn itself off

- Robots can **detect**
  - Walls $\frac{1}{2}$ block in front of them
  - Beepers by being on the same corner as a beeper
  - Robots on the same corner with it

- Robots can **navigate** by detecting the direction it is facing (north, south, east, west)

- Robots can **manipulate** beepers
  - by carrying them,
  - picking them up, and putting them down,
  - knowing if it is carrying any
Robot Tasks

- A task is something we want the robot to do
  - Escape from an enclosed room that has a door
  - Find a beeper and deposit it on origin
  - Escape from a maze

- A situation is an exact description of what the world looks like
  - Robot’s current position and direction it is facing?
  - Location and length of each wall section?
  - Location of each beeper?
  - How many beepers in the robots beeper bag?
Robot Messages

- To send a message we must specify the object and the behavior for that object
  - A reference to the receiver object
  - A period
  - The message to be sent

- To send a message to a Robot:

  ```java
  Karel.move();
  ```

  reference   message
Changing position

- *move()*:
  - moves forward to next corner if the path is clear
  - error-shutoff if the path is blocked by a wall

- *turnLeft()*:
  - pivots 90 degrees to the left (counter-clockwise)
  - stays on the same corner

- *turnOff()*:
  - the task is finished;
  - robot turns off and is incapable of executing any new instructions until restarted on another task
Robot Methods

- Manipulating beepers
  - `pickBeeper()`:
    - attempts to pick up beeper on the corner it is standing
    - an error shutoff if no beeper is there
    - if more than one beeper on the corner the robot picks up only one
  - `putBeeper()`:
    - attempts to put beeper on the corner it is standing
    - an error shutoff if no beeper in the beeper bag
    - if more than one beeper in the beeper bag the robot puts down only one
Simple Robot Task

Problem

- Program a Karel robot to place beepers on an empty world to form the VT logo of Va Tech