

LEGO Robotics Summer Camp



What is FIRST?

What is FIRST?

FIRST, or *For Inspiration and Recognition in Science and Technology*, is a non-profit organization dedicated to spreading education and growth in STEM-based fields. For over twenty-five years, FIRST has offered a variety of robotics challenges for teams of students of all ages, everything from FIRST Lego League Jr, oriented towards sparking interest in STEM in elementary school students, to FIRST Lego League, a more competitive FLL Jr., to FIRST Tech Challenge, a robotics competition for middle school aged students, to FIRST Robotics Competition, a high school-oriented competition teaching engineering, business, and many other essential skills for the modern world.

Designed as the ultimate sport for the mind, the FIRST Robotics Competition is described by participants as “the hardest fun you’ll ever have.”

More information can be found at FIRST’s website, firstinspires.org



Who is 3044?



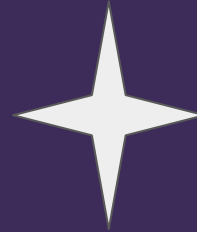
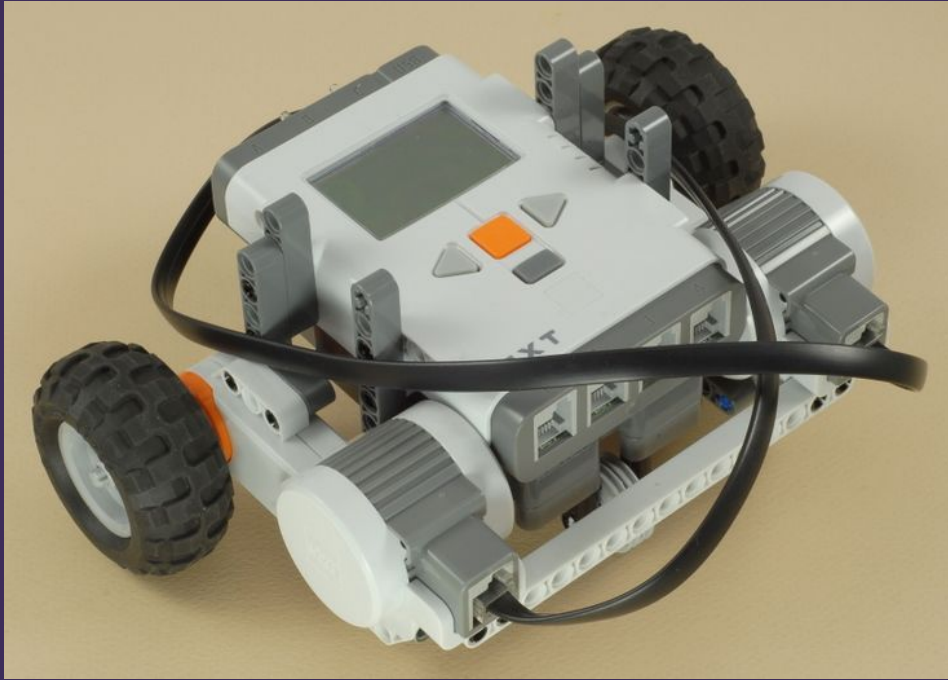


This Week

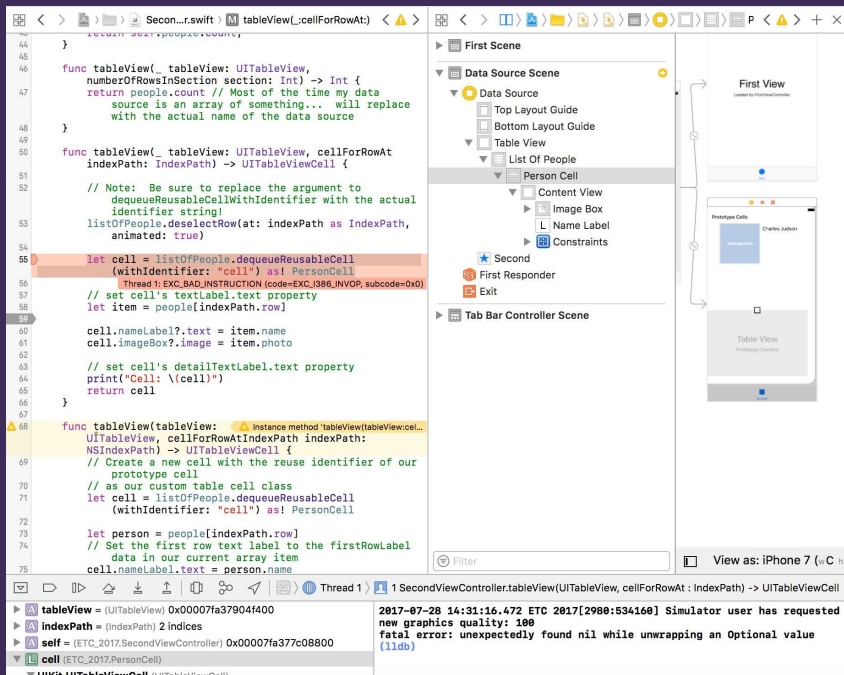
- ❖ Introduction to Design and Building
- ❖ Introduction to Programming
- ❖ Sensors: Light, Color, Touch, Ultrasonic
- ❖ End of Week Design and Programming Challenge!



Building a Basic Bot



How Does Programming Work?



```
func tableView(_ tableView: UITableView,
numberOfRowsInSection section: Int) -> Int {
    return people.count // Most of the time my data
    source is an array of something... will replace
    with the actual name of the data source
}

func tableView(_ tableView: UITableView, cellForRowAt indexPath: IndexPath) -> UITableViewCell {
    // Note: Be sure to replace the argument to
    dequeueReusableCellWithIdentifier with the actual
    identifier string!
    let cell = listofPeople.dequeueReusableCell(
        withIdentifier: "cell") as! PersonCell
    // set cell's titleLabel.text property
    let item = people[indexPath.row]
    cell.nameLabel?.text = item.name
    cell.imagebox?.image = item.photo
    // set cell's detailTextLabel.text property
    print("Cell: \(cell)")
    return cell
}

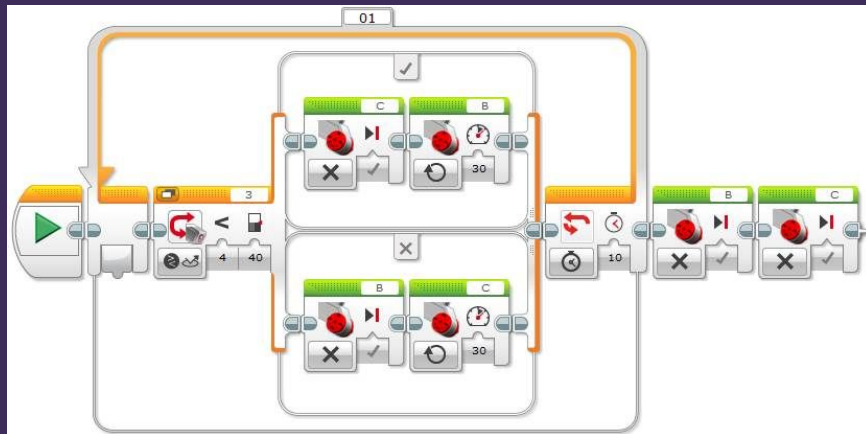
func tableView(tableView: UITableView, cellForRowAt indexPath: IndexPath) -> UITableViewCell {
    // Create a new cell with the reuse identifier of our
    // prototype cell
    let cell = listofPeople.dequeueReusableCell(
        withIdentifier: "cell") as! PersonCell

    let person = people[indexPath.row]
    // Set the first row text label to the firstRowLabel
    data in our current array item
    cell.nameLabel?.text = person.name
}
```

2017-07-28 14:31:16.472 ETC 2017[2980:534160] Simulator user has requested new graphics quality: 100
fatal error: unexpectedly found nil while unwrapping an Optional value (lldb)

← Programming CAN look like this

But FLL programming looks more like this



How Far is Far Enough?

Measuring Distance in Time

- ❖ Distance can be expressed as a value of time
- ❖ *Task: Have robot travel in a straight line forward for 3 seconds at one speed. Change the speed and run for the same time. What differences do you see?*
- ❖ What makes time less reliable?
- ❖ How else could we measure distance?

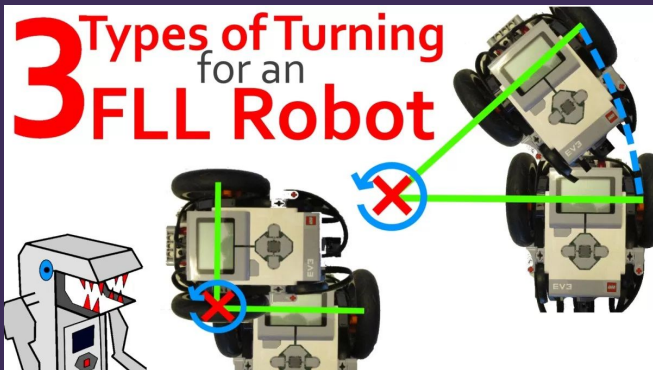
Measuring Distance in Rotations

- ❖ Instead of time, rotations are distance values equal to the circumference of the wheel.
- ❖ *Try the same task as before, but this time with rotations instead of time.*
- ❖ What do you notice?



Taking Turns

- ❖ There's more than one way to make a robot turn
- ❖ Can you list the three different ways?



- ❖ **Type 1:** One motor forward while the other motor is stationary
- ❖ **Type 2:** One motor at a higher speed than the other motor
- ❖ **Type 3:** One motor drives forward while the other drives backwards

Day 1 Challenge!

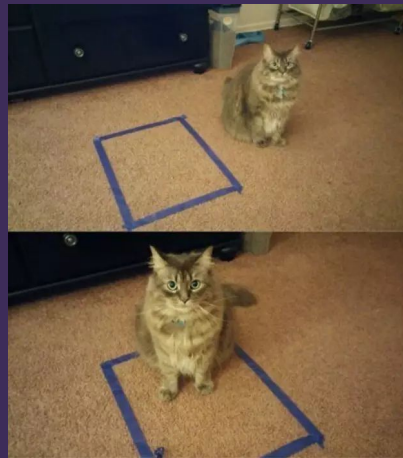
❖ Task: The Square

- Robot must complete a full lap of the square tape path on the floor
- Robot must integrate *ALL* three types of turns in it's lap around the square

❖ **Type 1:** One motor forward while the other motor is stationary

❖ **Type 2:** One motor at a higher speed than the other motor

❖ **Type 3:** One motor drives forward while the other drives backwards



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Day 2



Day 2: Touch Sensors

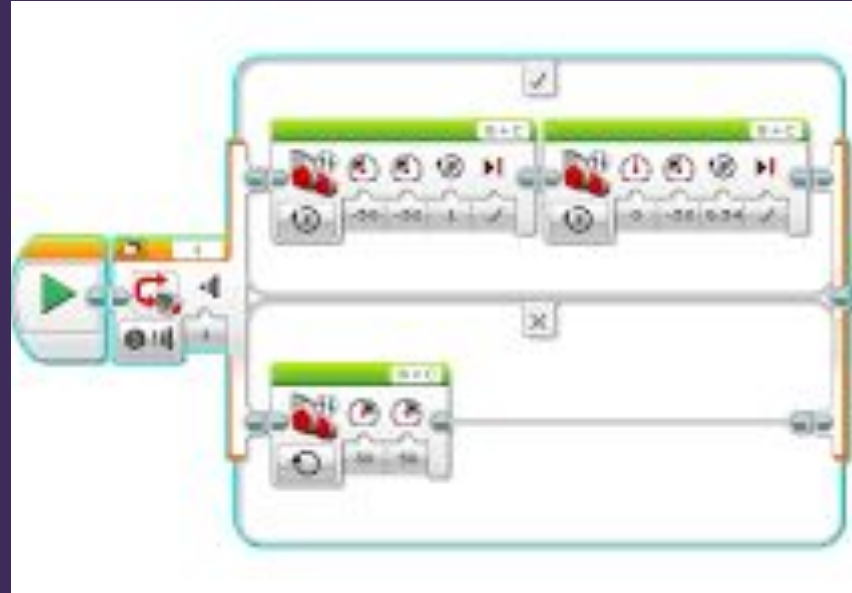
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Ballston Spa High School Robotics

FIRST Team 3044



- ❖ Programming with touch sensors
 - Loop function
 - Set to touch sensor
 - Give commands



Programming the
**EV3 Touch
Sensor**



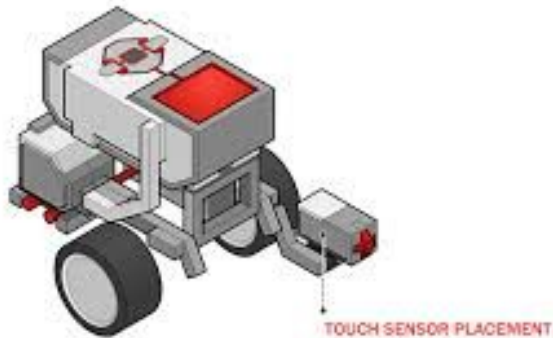
Touch Sensors

❖ Task:

- Mount 2 touch sensors on the front of your robot
- Test program

❖ Morning Challenge! Touch sensor obstacle course!

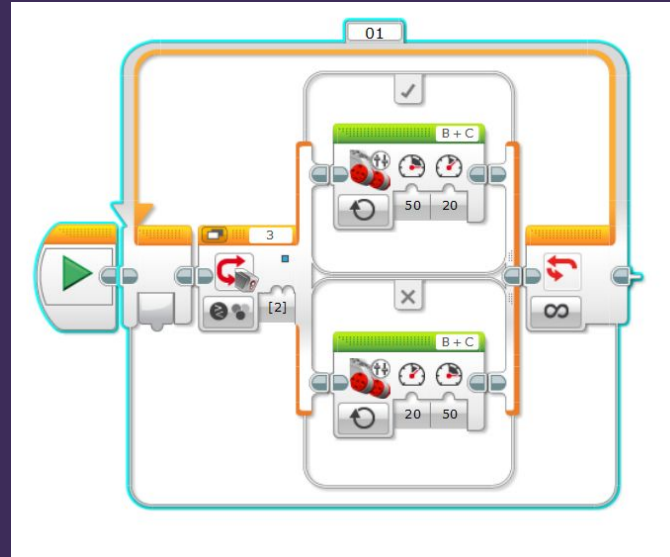
- Requirements: Robot must utilize 2 touch sensors to complete the obstacle course



Light Sensors

- ❖ Mount light sensor on the front center of your robot
- ❖ Program

- ❖ **Afternoon Challenge: Light Sensor Races!**
 - Robot will need to use a light sensor to follow a line



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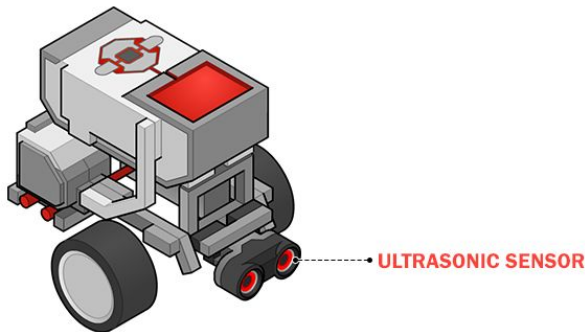
Day 3



Ultrasonic Sensors

❖ Task:

- Mount an ultrasonic sensor on the front of your robot



❖ Morning Challenge! Skunkbot

- Requirements: Robot must utilize 1 ultrasonic sensor
- When an object is <5inches away, your robot skunk must turn around and lift its tail.
- Need to build a tail using a motor.

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Day 4



Lego Zoo

❖ Task:

- Design and build an animal of your team's choice
 - Brainstorm 3 ideas, and present all 3 to a 3044 member, then decide on one
- Must include an ultrasonic, color, and touch sensor



Your animal will need to:

- ❖ Perform a trick of your team's choice, using 1 sensor
- ❖ Follow a tape course using the light sensor
- ❖ Must retrieve a toy and put it back in it's toy bin

