# Actor Details

|  |  |  |  |
| --- | --- | --- | --- |
|  | The Wanderer | The Navigator | Main Controller |
| Areas of Greatest Risk/Uncertainty/ Troublesome Points | * Making the fan fast and effective enough to be able to blow The Navigator | * The batteries controlling the servos last long enough * Understanding sail mechanics so that it’s easier for The Wanderer to blow The Navigator around * Making The Navigator lightweight yet sturdy * To what extent and how the audience needs to understand the flag language | * Figuring out how to set up 3 XBees communicating with each other |
| Mechanical Structure | * Should look somewhat like a modern speedboat * Maybe laser cut the body out of acrylic and glue the parts together * Should have a fan on the front   + Maybe try 3-D printing one (easier said than done though)   + Might need to make a shroud or funnel of sorts to direct the air better * Black rubber wheels * Space inside the boat to store the electronics | * Should look kind of old and deteriorated (could probably achieve this with acrylic paint) * Not sure what to make the body out of to make sure the body is lightweight enough to easily be blown around by The Wanderer * Mast made from a wooden dowel and maybe laser cut acrylic rings at the bottom to keep it in place with the help of glue * Sail made from a plastic bag and paper clips * Flags made from toothpicks, paper, and glue * Space in the boat to store the electronics | * A basic box (laser cut with acrylic) with   + all the inputs on the top   + Arduino, XBee, and batteries, and wires inside |
| Electronics | * Arduino * XBee Explorer + Breakout * 2 DC motors to control the wheels * 1 strong/fast DC motor to control the fan | * Arduino * XBee Explorer + Breakout * 2 small servo motors to control the flags | * Arduino * XBee Explorer + Breakout * Joystick to control the movement of The Wanderer * Button to switch the fan on/off * A means to control the movements of the fans (either of the following):   + Keyboard/Keypad matrix to type the message live   + An bunch of buttons to display pre-recorded messages |
| Software | * Arduino IDE * XCTU | * Arduino IDE * XCTU | * Arduino IDE * XCTU |
| Power | * 9V battery for the Arduino * 4 AA batteries (4.8 V) for the two DC motors attached to the wheels * A large battery for the motor controlling the fan (the drill said 7.2 V, but I’m not sure if that’s the actual requirement for the battery or something else) | * 9V battery for the Arduino * 4 AA batteries (4.8 V) for the servos (I’m not sure if this will last long enough though) | * 9V battery for the Arduino |
| Parts List | * Arduino * XBee Explorer + Breakout * 2 regular DC motors * 1 strong/fast motor for the fan | * Arduino * XBee Explorer + Breakout * 2 small servos | * Arduino * XBee Explorer + Breakout * 1 or several push buttons * Joystick + Breakout * Keyboard/Keypad matrix (maybe) |

# Combined Parts List for Ease of Reference:

* 3 Arduinos
* 3 XBees + 3 Breakouts
* 2 regular DC motors
* 1 strong/fast motor for the fan
* 2 small servos
* 1 or several push buttons
* Joystick + Breakout
* Keyboard/Keypad matrix (maybe)

\*Note: The only thing I’m missing and isn’t easily available in the lab would be the keyboard/keypad matrix. Although, I suppose it is possible to make it with lots of buttons, in which case, I need James’ permission to use that many buttons (I don’t think we have that many) or get creative in making my own buttons.

\*\*Note: Also, hopefully the motor for the fan will serve its purpose well. Worst case scenario: the fan is there for aesthetic purposes and The Wanderer just physically pushes The Navigator around.

# Shortened List of Tasks

* Wanderer fan physical construction
* Wanderer body physical construction
* Wanderer code
* Navigator body physical construction
* Navigator sail physical construction
* Navigator flags physical construction
* Navigator flag control system code
* Control box circuit
  + Joystick
  + Button for fan
  + Pre-recorded messages option
  + Live message writing option
* Control box physical construction
* Figure out how to create a network system for 3 XBees to communicate with each other
* Make final circuits
  + Wanderer
  + Navigator
  + Control Box
* Script
* Rehearse with Luīze

# Detailed List of Tasks

* Wanderer fan physical construction
  + Figure out how to connect the drill motor to the Arduino Motor Shield
  + Make a fan
    - Design a fan + funnel/shroud
    - 3-D print this
    - Rip off the supports gently
    - Connect the fan to the motor
  + Make some kind of bracket or thingy to hold the fan + motor together and attach it to the body of the robot
    - Design
    - Make
    - Assemble
  + Test that the fan works
    - Write some code
    - See if it can push The Navigator
  + Iterate on fan design until it works…
    - Design
    - 3-D Print
    - Rip off supports
    - Connect to motor
* Wanderer body physical construction
  + Design a body
    - Prototype with cardboard/paper
    - Convert to a digital file on Illustrator
    - Laser cut the parts
    - Assemble and glue together
    - Notes
      * Space for Arduino, XBee, wheels, fan, and caster wheel
  + Add all the electronic components
    - Arduino
    - XBee
    - Wheels
    - Caster wheel
      * Make one like how Jennifer did with the marble?
      * Find a marble
      * Design
      * 3-D print
      * Attach to the body at the right height
* Wanderer code
  + Receive information from Controller Arduino
    - [movement direction, fan state]
  + Move the robot accordingly
  + Turn the fan on/off accordingly
  + Test that everything works
  + Debug
* Navigator body physical construction
  + Figure out which material/method to use
  + Design a body
    - Prototype with cardboard/paper
    - Figure out optimal place for servos
      * They should be able to rotate freely
      * The flags moving should be visible to the audience
    - Convert to a digital file on Illustrator
    - Laser cut the parts
    - Assemble and glue together
    - Paint the body
    - Notes
      * Space for Arduino, XBee, sail, servo/flags
      * Make holes for the caster wheel screws
  + Add all the other components
    - Arduino
    - XBee
    - Servos
    - Flags
    - Sail
    - Caster wheels x 4
* Navigator sail physical construction
  + Mast
    - Find and cut a dowel to the right height
    - Design and laser cut acrylic rings to keep the dowel in place at the base
  + Sail
    - Ask Jon or Robert if they know anything about sails
    - Design a sail
    - Make links with paper clips
    - Make supporting structures with the bendable metal rods or wooden dowels
    - Cut out a sail from a plastic bag
    - Assemble the sail
    - Test it with the fan on the Wanderer
    - Iterate
* Navigator flags physical construction
  + Figure out optimal location of servos
  + Attach servos properly to the body
    - Screws? Bracket?
    - Design
    - Make
    - Assemble
  + Make flags
    - Figure out optimal dimensions
    - Create with toothpicks or wooden sticks
    - Make flags out of paper
    - Assemble
* Navigator flag control system code
  + Make a table
    - Figure out the orientations of the servos and what degree each position refers to
    - Write out positions for the left and right servo for each letter, number, and special codes
  + Code
    - Receive information from the control box
      * If pre-recorded message, then
        + [counter to parse the array of messages, whether or not to start playing the message]
      * If keyboard
        + [character to display, whether or not to start display]
    - Create a function or array for each letter, number, or special symbol
      * When a certain letter or number, etc. is requested, then the output is two positions (in degrees) for the two servos
    - Create a function that parses through each character in a given string
    - Create a function that takes the positions of the servos as the argument and causes the servos to reach the desired position
    - Create a pause (make a class?) in between each movement between each letter
    - Test that everything works
    - Debug
* Control box circuit
  + Joystick
    - Find one
    - Figure out how to wire it up
    - Code it to change the direction of the Wanderer (forward, backward, left, right)
    - Send the code from the Controller Arduino to the Wanderer Arduino
    - Test that this works
    - Debug
  + Button for fan
    - Find one
    - Wire it up
    - Code it to turn the fan on and off
    - Send the code from the Controller Arduino to the Wanderer Arduino
    - Test that this works
    - Debug
  + Pre-recorded messages option:
    - Have an array of strings (one per message)
    - Find a button
    - Wire it up
    - Code it to change the counter to parse through the array
    - Send the code from the Controller Arduino to the Navigator Arduino
    - Test that this works
    - Debug
  + Live message writing option:
    - Make the input
      * Either find or create a keyboard/keypad matrix
      * Research how to make it and how it works
      * Find all the needed materials
      * Wire everything up
      * Code it to display in the serial monitor the letter/number that’s pressed
      * Send the code from the Controller Arduino to the Navigator Arduino
      * Test that this works
      * Debug
* Control box physical construction
  + Design a box
  + Put holes for each input
    - Measure everything
    - Create test holes with the laser cutter
    - Engrave a title for each input
  + Laser cut the box
  + Assemble the box
    - Put the Arduino, Xbees inside
    - Put the inputs through the holes
    - Use glue
  + Test that nothing broke and everything still works
  + Debug
* Figure out how to create a network system for 3 XBees to communicate with each other
  + Research
  + Configure with XCTU
  + Write some sample code
  + Test
  + Debug
* Make final circuits
  + Wanderer
    - Fritzing schematic
      * XBee
      * Fan?
    - PCB design
    - Show Michael
    - Make the PCB
    - Solder everything
    - Test to make sure everything still works
    - Debug
  + Navigator
    - Fritzing schematic
      * XBee
      * 2 servos
    - PCB design
    - Show Michael
    - Make the PCB
    - Solder everything
    - Test to make sure everything still works
    - Debug
  + Control Box
    - Fritzing schematic
      * XBee
      * Joystick
      * Button for fan
      * Button(s) for messages
    - PCB design
    - Show Michael
    - Make the PCB
    - Solder everything
    - Test to make sure everything still works
    - Debug
* Script
* Rehearse with Luīze

# Schedule

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|  |  | 14  Script  Wanderer fan  XBees setup | 15  Script  XBees setup | 16  Script  Wanderer Code  Navigator Code | 17  Script  Navigator Code | 18  Script  Navigator Code |
| 19  Navigator sail  Control box circuit  Control box code | 20  Control box code | 21  Control box code | 22  Control box physical construction | 23  Wanderer fan | 24  Control box final circuit design | 25  Control box final circuit design  Navigator final circuit design  Wanderer final circuit design |
| 26  Control box, Navigator, and Wanderer final circuit print and solder | 27  Test that everything still works | 28  Wanderer fan  Wanderer and Navigator physical construction | 29  Wanderer fan  Wanderer and Navigator physical construction | 30  Wanderer fan  Wanderer and Navigator physical construction | 1  Fix up all code | 2  Fix up all code |
| 3  Wanderer fan  Wanderer and Navigator physical construction | 4  Wanderer fan  Wanderer and Navigator physical construction | 5  Rehearse  Fix up problems | 6  Rehearse  Fix up problems | 7  Tech rehearsal | 8  Fix all problems | 9  Fix all problems |
| 10  Fix all problems  Rehearse | 11  Rehearse | 12  Dress rehearsal | 13  Show | 14 |  |  |