# LEGO Sumo-bots Demo NIWeek 2017

## How to set up:

1. Set the two robots into the center of the ring, facing away from each other. They should already have three programs loaded onto each brick.
2. There are two spare bricks that should be plugged in to the charging cables as backups for when the current bricks run low on battery.
3. Power on each of the robots by pressing and holding the center button on the brick.

## How to run during the day:

1. Have the customers choose which one of the robots they would like to use (Red for LabVIEW, Blue for Mindstorms) and then which strategy they would like to run (Ares, Predator, or Crazy Ivan).
2. Have both robots in starting position (in the middle of the ring, facing away from each other outwards) and then have the customers start the match on the word “3, 2, 1, SUMO!” by pressing the center buttons on the MINDSTORMS bricks.
3. Rules:
   1. The winner is the robot which can push the other robot so that both color sensors and both wheels are in the white portion of the ring.
   2. A disabled robot (tipped over, falls off the ring, loses a piece) automatically loses the battle.
   3. If there is a deadlock (Robots are stuck together or pushing against each other and going nowhere) for more than five seconds, the battle is reset.
   4. No hardware modifications are allowed.
   5. No software modifications other than sensor calibrations are allowed.
   6. The referee (you) has final say on wins, losses, or draws.
4. When a brick is running low on power (there is a battery indicator at the top left of the screen)
   1. Pull the red chassis attachment pins out one segment
   2. Detach the sensor cables
   3. Lift the brick free and swap out the bricks with its counterpart. \*\*The firmware versions for compatibility with LabVIEW and the MINDSTORMS software are different, DO NOT mix the bricks up!\*\*
   4. Attach the sensor cables to the color-coded ports
   5. Attach the brick to the chassis using the red attachment pins
   6. Plug the low-battery brick into the charger

## How to turn it off & store at the end of the day

1. To save battery or to turn it off at the end of the day, press the back (top left) button on the MINDSTORMS brick until the power menu appears on the screen, then select the check mark to power the brick off.
2. Plug in all four bricks to the charging cables so they will be ready for the next day.

## Troubleshooting

1. Port View
   1. If a sensor is not behaving or responding properly, make sure that the ports are receiving values properly. You can do this by using Port View
      1. From the main menu, press on the right or left brick buttons to select the Programming menu
      2. Select Port View by pressing the center brick button
      3. Using the directional brick buttons, navigate to the corresponding sensor port
      4. Typical sensor values:
         1. Front Color Sensor: 80-87% reflection on white, 9-11% on black
         2. Ultrasonic Distance Sensor: >150 cm (250 cm max) when nothing in front of sensor, 3-4 cm when hand placed in front near front bumper
         3. Touch Sensor: 0 when not pressed, 1 when pressed
         4. Back Color Sensor: 35-39% reflection on white, 2-3% on black
      5. If these values are off, you can change the calibration values in the Mindstorms or LabVIEW code and push them to the bricks via the USB cable.
      6. The defaults for the calibration values are 25% reflection and 20 cm distance
2. One robot winning a lot, seems to have a significant advantage over the other
   1. If the battery on a brick is running low, the robot will have less power in the motors. Make sure that the robots have similar charge levels when battling.
   2. The LEGO wheels wear pretty quickly, so swapping out some of the wheels (you can just pull them off fairly easily) or trading one wheel between bots could even the playing field a little.
3. You should not have to push software to the bricks from LabVIEW or the MINDSTORMS software, but if you do, LabVIEW and the MINDSTORMS software cannot share the brick as a resource, one will lock the other’s access of the brick out if both are running.