Abstract
This study examines the feasibility of using motion control in robotics either for recreational purposes or teaching and training purposes. Participants were given an opportunity to use the robot and Leap Motion® control system, shown in figure 1, while being qualitatively observed on how well they were able to use the control system in the short learning time allotted. The feasibility of this system is judged based on how well the participants, ranging in age from 7 years old to 50 years old, were able to learn and use the system to control a simple robot.

Introduction
Traditionally, robots are controlled using either a physical controller or joystick, or pre-programmed to function autonomously. With both of these options, however, there is a large “learning curve” to be able to use the robot effectively, as the user must either learn how to program the robot to perform it’s autonomous tasks, or must learn the control layout if using a joystick. This can make it difficult for younger or older people, who may not be as experienced with systems similar to this, to use a robot. This study looks at the possibility of using a motion sensor to create a more intuitive control system for a simple robot, and examines the feasibility and functionality of this system.

For this study, a simple robot was constructed that would be able to move around and collect objects on the ground. This robot, shown in figure 2, was constructed using laser cut wood and a 3d printer. The robot features an Arduino Uno microcontroller, communicating wirelessly with a control computer via Xbee wireless modules. The Arduino accepts a character sent wirelessly through the Xbee serial ports, and then reads the character sent and then sends a signal through to a Texas Instruments h-bridge integrated circuit chip to control two modified servomotors with wheels attached. This results in a simple wireless robot capable of moving and collecting small objects, in the case of this test, dice, scattered on the ground.

The robot and control system was tested at two locations: the Mercer University Robotics Lab, and the First Robotics Competition in Atlanta, Georgia. In both cases, participants of all ages were offered the opportunity to try to round up a number of dice scattered around the floor, as shown in figure 3. Participants were first told how to control the robot and then after driving the robot for some time were asked about what they thought of the control system. During the testing, administrators also observed how quickly participants were able to become proficient at operating the robot.

The Leap Motion Sensor, which can be seen beside the robot in figure 1, is an infrared motion sensor intended to be used as an alternative input device for a computer, making tasks such as 3d modeling, painting, and making music more intuitive than a traditional mouse. This principle, of providing a more intuitive control system, is the reason why this is being studied for potential implementations in robotics. The Leap Motion company encourages software developers to create programs to use the Leap Motion Sensor, and provide a Software Development Kit, or SDK, to do so. To create the control system used in this test, the official Leap SDK was used to create a Python program which reads the palm position data from the Leap Motion Sensor, translates the data to a character, and sends the character over se-

Results
After observing countless participants of all ages, a few common tendencies were observed. In order to work properly, the Leap Motion Sensor requires the user’s hand to be at least a certain distance away. Many participants, especially the younger participants, tended to lower their hand below the threshold, thus making any commands unrecognizable to the Leap. Another common observation was that the Leap was not always responsive. It would, on occasion, be unable to sense where the hand and fingers were, thus misinterpreting commands.

While the Leap Motion Sensor system provides a different and intuitive way to interact with technology, it is not responsive enough currently to have any major implementation. Additionally, the system does not work if the user places his or her hand too close to the sensor, which is a very common thing to do, especially for the younger users. The Leap Motion sensor is ready for use for recreational purposes, but is not ready to be marketed as a “better” robotics control system.

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References
www.leapmotion.com