PRESENTATION

FOLLOW ALONG WITH YOUR WORKBOOKS
WELCOME BOY SCOUTS

- Grace Covenant Troop 777
- Robotics Merit Badge
- Alan Burdick
Session II
ROBOTICS INDUSTRY
REQUIREMENT 2

2. **Robotics industry**, Discuss the following:
   a. The kinds of things robots can do and how robots are best used today.
      - What can they do?
      - How are they best used?
   b. Similarities and differences between remote-control vehicles, telerobots, and autonomous robots
      - Similarities
      - Differences
REQUIREMENT 2

2. **Robotics industry**, Discuss the following:
   
c. Three different methods robots can use to move themselves other than wheels or tracks

1. ___________________________________________  
2. ___________________________________________  
3. ___________________________________________

Describe when it would be appropriate to use each method.

1. ___________________________________________  
2. ___________________________________________  
3. ___________________________________________
What is a robot?

Robot comes from the Czech word *robota*, meaning drudgery or slave-like labor.
Four D’s of Robotics

Dangerous

Dull

Dirty

Difficult
Why Use Robots?

- Most robots are designed to be a helping hand. They help people with tasks that would be difficult, dirty, dangerous, or dull for a human.

- Can carry very heavy loads

- Do not get bored doing the same job over and over again, 24 hours a day.

- Have been proven to increase productivity.
What can robots do? & How are they used today?
## Similarities and Differences

<table>
<thead>
<tr>
<th>Remote-Control Devices</th>
<th>Telerobots</th>
<th>Autonomous robots</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical link between controller and object being controlled</td>
<td>No physical connection to the remotely operated system (i.e. WiFi). Requires remote sensory feedback</td>
<td>Makes decisions based on programming and sensory feedback. Controlled by an internal computer.</td>
</tr>
<tr>
<td>Human operator is controlling the device without physically touching it</td>
<td>Human operator is controlling the device without physically touching it</td>
<td>Work for an extended period without human intervention</td>
</tr>
<tr>
<td>Short Distance</td>
<td>Any Distance</td>
<td>Any Distance</td>
</tr>
<tr>
<td>Requires remote camera or interactive component to sense what is happening on the remote end of the system</td>
<td>Gains information and about the surrounding environment and adapt to changes.</td>
<td></td>
</tr>
</tbody>
</table>
What are the differences?
ROBOTICS INDUSTRY — FIELDS

- Human-robot interface
- Mobility
- Manipulation
- Programming
- Sensors
Human interfaces

- Autonomous interfaces: controlled by its internal computer. It operates and controls itself.
Human interfaces

- Telerobot: remote manipulation much more complex than remote control
Human interfaces

• Remote control: such as remote control cars, are simple remote control.
When would you use these different types of movement?
Methods To Move
Other than by tracks & wheels

- Swimming Robots
- Flying Robots
- Climbing Robots
- Walking Robots
- Adhesive bond
- Electrostatic bond
What are the 7 broad areas often Using Robots?

1. Dangerous environment
2. Industrial
3. Entertainment and Leisure
4. Space
5. Research
6. Underwater
7. Medical
Dangerous Environments

- Carrying out bomb disposal
- Collecting data from volcanoes
- Exploring
- Military
- Rescue
Dangerous Environments

- Predator flown via remote control by airmen on the ground flies up to 25,000 feet.
- Used to conduct reconnaissance and attack operations; takes real-time photos of troop movements on ground.

**Designed for Firefighter Rescue**

- Use’s its arms to identify and pick up people who might have passed out from smoke and fumes.
Industrial Robots

- A typical industrial robot is a robot arm with several independent joints and you will see them welding, painting and handling heavy materials..

- ‘Pick and place’ robots can move products from a conveyor belt to package them at very quick speeds.
Industrial Robots

An example of a mobile robot that is in common use today is the *automated guided vehicle* (AGV).

- An AGV is a mobile robot that follows markers or wires in the floor, or uses vision or lasers.
Robots are very useful in food processing since it needs to be done in a germ-free environment.
NASA is constantly developing and producing robots which can perform maintenance in space – especially on its International Space Station.

- 2003 Rover landing on Mars
Space Robots

Humanoid robot joined crew of International Space Station
Research Robots

• One important area of robotics research is to enable the robot to cope with its environment.

• Honda is the company that is spending a great deal of money developing research robots, such as the Asimo show on left.

• ASIMO moves like we do and could be useful to help the elderly or people in wheelchairs. It can answer the door, pick up the phone or get a cup of tea.
Underwater Robots

- Underwater robots are often remote controlled vehicles with thrusters for maneuvering and robot arms for grabbing.
- They are particularly useful in the oil industry for welding and valve maintenance on oilrigs.
- Robotuna used for exploration.

RoboTuna, developed at MIT, was designed to swim like a real tuna. What good is a robotic fish? A speedy, energy-efficient underwater robot could be used for underwater exploration or covert surveillance. [Click for larger images.] Photos courtesy of Josh Tolford Davis, MIT Towing Tank, Massachusetts Institute of Technology.
Future Medical Robots

Scientists believe that tiny robots (called “nanorobots”) will be developed which will be used in patients’ bloodstreams to cure illness.
Medical Robots

Used in minimal invasive surgical procedures that reduce trauma in surgery.

In laboratories, used to transport biological or chemical samples between instruments.

Prosthetics.
3. General Knowledge, Discuss three of the five major fields of robotics (human-robot interface, mobility, manipulation, sensor) and their importance to robotics development. Discuss either the three fields as they relate to a single robot system OR talk about each field in general:

1. ________________________________________________________________
2. ________________________________________________________________
3. ________________________________________________________________

_____ Find pictures or at least one video for discussion
MAJOR FIELDS OF ROBOTICS

1. Human-robotic interface
2. Mobility or Locomotion
3. Manipulation
4. Programming
5. Sensors and Perception
Human-robotic interface

• How does the robot and operator communicate with each other?

• The Interface is HOW the human operator controls the robot.

Examples.

a) Controller for a Xbox or Wii game
b) Computer keyboard used to program a robot.
Mobility or Locomotion

• How does the robot move?
• Some only need to move arms or grippers
• Others need to be completely mobile and move from place to place

Examples.

a) A robotic arm rotates and stops at a specific position to paint car parts

b) An operator directs a Sedway personal transporter to move from one location to another.
Manipulation

• How does the robot physically handle objects?

Examples.

a) Mechanical claw picks up & transports objects.

b) Robotic arm w/ mechanical grippers load candy into boxes.

c) Robotic hand welds a seam on a car and paints the car.
Sensors and Perception

• Robots rely on sensors to get information about their surroundings to determine where it is and what it should do next.

• Examples.

a) Ultrasonic sensors determines the distance of objects by emitting sound pulses (too high humans to hear), and then measuring the time delay to detect the sound pulse echo. Used in submarine navigation since it works in the dark.
Sensors and Perception

Examples.

b) Light sensors can be used for simple navigation by allowing a robot to follow a line, such as w/ AGVs. Other robots navigate using infrared light (the same invisible light used in your TV remote control).

c) Touch sensors help otherwise blind robots with navigation: feelers, contact switches, bump sensors. . .all let a robot know when it has made contact with walls or objects. i.e. Robotic vacuums

d) Radio signal sensors let robots communicate with each other at a distance. Electromagnetic sensors are used by robotic lawnmowers to stay within the bounds of the yard.
Robotics Part 2 & 3

• Please complete workbook sections 2 and 3.
• Before starting the next session please obtain an engineering notebook.
• Put your name and date on the inside cover of your book.
• See counselor for more details.