**NIE ACTIVITY**

*Tarek M. Sobh, PhD, PE*

# Swarm Robots

Have you ever seen a colony of ants busy at work to collect food and carry it off to some destination? How do ants know what to do and how to work together? Scientists will tell you that individually, ants are not so smart, but they have a collective intelligence as a group or entire colony that allows them to survive, reproduce, carry out tasks, attack, and protect each other. Some **engineers** are interested in creating **algorithms** that can recreate these behaviors for **robots**.

Usually we think of a single robot that is sufficiently sophisticated to carry out complex tasks, but these types of robots can be very, very expensive. So, what if engineers design simple and inexpensive robots that individually are programmed to perform very simple behaviors that, when put together, can accomplish a task more effectively or efficiently? Projects to develop **multi-robot systems** are being conducted in different research laboratories around the world by robotics engineers who are interested in this idea.

Here is an example: You want a robot to paint a room. Instead of programming one smart and very expensive robot, you use 50 or 100 smaller and very cheap robots with limited aptitude. The small robots would each have location **sensors**, simple communication **modules**, and vision capability to be able to move away from each other and start painting their little part of the wall in parallel. The entire room would be painted in a fraction of the time required by one robot, and it would be much less expensive.

## Skills and Knowledge Needed:

Robotics engineers usually earn at least a bachelor's degree in computer science, computer engineering or another engineering discipline. Computer scientists develop the computation and programming languages for a robot or multi-robot system. Electrical, mechanical, and computer engineers design the robot's hardware and help integrate the programming with that hardware.

# WORDS TO KNOW

- **Engineers**-college-educated professionals who apply mathematics and science to discover new solutions for complex technical problems
- **Robot**- an electro- mechanical system that can be programmed to perform different tasks
- **Algorithms**- mathematical and reasoning steps that are developed to compute or execute a sequential or parallel task or function
- **Multi-robot system**- a group of robots that are designed to work together
- **Sensors**- devices designed to detect some physical characteristic of another object (cameras, pressure sensors, temperature sensors, GPS location sensors, etc.)
- **Modules** - groups of components that are arranged together to perform single functions

## Meet the Scientist

When I was young I loved building and creating things with erector sets. That is how I became interested in engineering. My father was a civil engineer and I was always very good in math. I studied engineering with honors in computer science and automatic control at Alexandria University in Egypt. Later I earned my masters and doctorate degrees in computer and information science from the School of Engineering at the University of Pennsylvania. In my spare time I enjoy scuba diving and playing soccer.

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## Websites To Visit

**Jellyfish Elimination Robotic Swarm**
http://news.discovery.com/tech/robotics/robot-targets-jellyfish-and-shreds-them-131003.htm
**Core Magazine@Gadget Show 2013 (Swarm Robots)**
http://www.youtube.com/watch?v=P85XU6YY6Xk
**Swarm Robots**

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