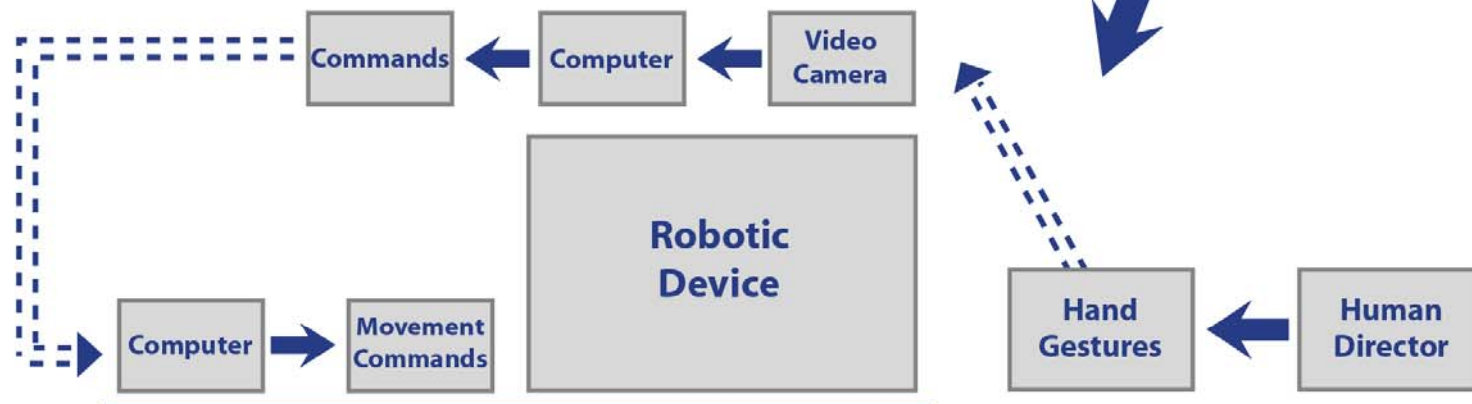


Hand Gesturing Technology for UAV, Robots, Control & Communications



U. S. Navy's Hand Gesturing Technology Available for Licensing

Summary Technology Description

The Navy needed to visually communicate with Unmanned Aerial Vehicles (UAV) as they land on aircraft carriers. A simple visual recognition system entailing a camera and processing system attached to the UAV was developed. The system can interpret in near real time 20 unique hand signal commands as the UAV lands. The Navy's Naval Air Warfare Center has developed the technology and algorithms for a working device.

Synopsis of Market Opportunity

This Hand Gesturing Technology can be used and easily adapted for:

- Interactive video games
- Interactive computer games
- Remote control toys such as cars, planes, boats, etc.
- Controlling various heavy equipment such as cranes where hand motions could be used to signal crane operation for moving and positioning various loads at construction sites, seaport loading docks, etc.
- Controlling robots
- Remote control for high RF noise environment or where RF remote signaling is a potential problem such as in controlling a robot in a mine field
- Human interface with computers
- Assistive technology for paraplegics, visually impaired, etc.
- Personnel training/simulation video programs

Technology Description

Because of the numerous emf noise and interference present on an aircraft carrier, a means for visual communication with a landing UAV was needed. The communication and control of the UAV needed to be near real time and simple with little or no lag in control. To accomplish this, the signal processing needed to be very simple and require little computer processing. Larry Venetsky of the Naval Air Warfare Center developed a visual signaling system with a well defined vocabulary from a set of unique body/hand signals that could be seen by a camera on a UAV, even in inclement weather. To minimize the computational power required to interpret camera acquired frames of a signal person's hand/body gesturing commands, four light markers, which emitted a well defined wavelength of light, are positioned on the head, the torso and on each hand. Inexpensive, readily available, dependable 740 nm IR LEDs have been used on the prototype unit. By utilizing the appropriate optical filters on the camera lens that pass light of only the wavelength emitted from the LEDs, positions of only four points need to be identified for each frame of video collected, translating into only 8 numbers/frame that need to be identified and used in a very simple algorithm for interpreting a particular hand/body signal. Some of the words are defined by dynamic motions of the hands and body. To interpret these signals, around 13 video frames are required; translating into an overall collection of approximately 100 numbers per second for defining the dynamic relative coordinates of a set of hand/body signals. This number set is extremely low; particularly considering the number of pixels that is required to define the image pixel coordinates of one frame can easily exceed 10,000 or 20,000.

A patent application has been submitted for this technology.

Product/Service Concept

A proof of principle has been established with a working laboratory prototype and a significant amount of test data has been obtained. The device utilizes readily available, inexpensive, off the shelf components. Since extremely low computing power is required to read and interpret in near real time the hand/body signals, size of device would be small and the cost is anticipated to be low for large quantities produced.

Target Market

One market that could be targeted for this hand gesturing technology is the video and computer gaming industry. The trend is to have games that involve more active interaction of the video/computer game with the gamer. There are currently games that require the gamer to interact with the game by stepping/dancing on a sensor mat, playing a guitar, swinging a golf club, etc. The latest release by Nintendo (i.e. Nintendo Wii) entails tracking motions of gamer as they participate in the game. This technology would be readily and easily adaptable to gaming devices. Handheld controllers typically have on the order of 15 to 20 button commands for playing the game. The Hand Gesturing technology presently developed for UAVs has 20 commands. Additional commands can be easily programmed. It is conceivable that even a new game that involves landing planes on airfields/aircraft carriers by solely using hand signals could be developed. Since very little computing power is required for this technology, the reactions times should be almost instantaneous. All of the support hardware such as IR diodes (used in any TV remote controls, etc.) and solid state camera are readily available and very reasonably priced. Annual 2004 U.S. retail sales of video games, which includes portable and console hardware, software and accessories, reached more than \$9.9 billion (http://retailindustry.about.com/od/seg_toys/a/bl_npd012703.htm).

Potential Strategic Alliances/ Partners

Would potentially require a partnership with a data acquisition hardware company such as Technest through their Advanced Imaging Division. They would develop the DSP board and camera all packaged in a small volume which is currently a 2" X 2" X 2" cube. Another option is for licensee to provide this expertise.

Preferred Method or Form of License or Alliance

First preference is to license technology. Also open to working jointly with the Navy on a project through a Cooperative Research and Development Agreement.

For more information and questions please contact:

Kevin Smith, PhD
SAIC / Tech-Scouts
Ph: 724-539-8310
Fax: 724-539-7002
ksmith@tech-scouts.net