Proposal for

Phantom

Handheld Digital Communication and Navigation Device

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Introduction:

In the history of warfare, victory has always hinged on the effective communication and coordination of forces. Battles, and ultimately wars, are won by information superiority. In medieval times, units were identified on the battlefield by large, brightly colored flags. Today, modern warfare uses a vast and complex network of technologies that is collecting, processing and redistributing real-time information at an unprecedented rate. “Phantom” will place some of this information processing ability into the hands of the fighters on the ground, thus enhancing communication, navigation, and coordination while reducing fratricide and the “fog of war.” Phantom will give your ground combat fighters superior situational awareness and communication abilities, which will in the end save their lives and win your war.

Description:

Phantom will utilize Global Positioning Satellites (GPS) for self location. The GPS module receives and interprets the GPS signals, and streams the National Marine Electronics Association (NMEA) 0183 standard message over a serial command interface with the microcontroller. The microcontroller will in turn further decode the NMEA 0183 message into pertinent location information. The numeric grid location of the device will be displayed on the Liquid Crystal Display (LCD) for the user’s reference. The grid location of the device will also be transmitted via a Radio Frequency (RF) transceiver to other Phantom devices up to 1500m away. The device that receives the location will plot the grid location on the LCD. The user’s own location and the location of other Phantom devices relative to himself will be shown with a graphical aid. This will allow the user to glance at the display and quickly see where other Phantom devices are around him. For example, Phantom can indicate to the user that another Phantom device is operating 600m to the NW. This same approach will also aid in fast target location. The user can enter a measured direction and range estimation, and the device will determine the grid location and plot it on the LCD, and give the user the option to transmit this information to other Phantom units. Figure 2 shows a representation of this.

The LCD module proposed to be used is made by 4D Systems. The reason this module is desired is because it contains LCD driver firmware that will decode commands sent to it over a serial command interface. There are 44 commands in three command sets for operating the LCD. These simple command and argument based instructions allow for simple object orientated control of the LCD. The LCD module also includes a micro-SD memory card adapter for storing of icons, images, animations, or other data. This will allow the device to have an aesthetic and easy to use interface, as well as store maps and graphical aids that assist navigation.

In addition to Phantom and target location sharing, the digital RF communication will also allow the user to send digital text messages to other devices. The text messages can be any message the user enters, but combat report storage and automation will be available. Data security may be attained with encryption by the transmitter and decryption by the receiver. Advanced Encryption Standard (AES), also known as Rijndael, is the mostly widely used and is an official encryption standard used by the U.S. government. AES can support key strengths of 128, 192, or 256 bits. There are many public domain sources available to implement AES.

Phantom will include other security features such as a “panic” function that will make it transmit its current position and an SOS code. A “zeroize” function will also be implemented so that the device can quickly be rendered useless. This will prevent device use by unintended persons, as well as limit the potential for reverse engineering.
The microcontroller will coordinate all the incoming and outgoing data from the various modules, and present the information to the user via a graphical interface on the LCD. User input will be through a simple keypad. Figure 1 graphically represents this. Figure 3 (attached) shows the completed Phantom concept art.

Benefits:

The benefits of the Phantom are clear. Victory on the battlefield comes from effective Command, Control, and Communication (C³). Phantom gives commanders another channel of communication with troops, and it simplifies situational awareness and coordination for the troops. Similar systems exist already, such as the Blue Force Tracker. This is a vehicle mounted system that has proved its value in combat. Other devices also exist that collectively do what Phantom does. Handheld GPS units and radios are readily available. Digital communication devices exist. However, there is not a widely fielded device that encompasses all of these tools. Essentially, Phantom will give the soldier on the ground information superiority and enable him to exploit it.

Development:

A prototype will be developed using a microcontroller demonstration board and OEM modules. The resources of Western Washington University's Electronic Engineering Technology program will be used to develop, build, debug, test, and demonstrate the hardware and software solutions. The final demonstration will be two to three Phantom units built and running, fully featured and ready for visitors to try.
Figure 3. Phantom conceptart.