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Using the Internet of Things to Gain and Maintain Situational Awareness in Dense Urban Environments and Mega Cities

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It may prove beneficial to leverage the internet of things (IOT) in order to provide our Soldiers, Sailors, Airmen and Marines the decisive advantage needed to fight and win future armed conflicts. It can be anticipated that connected devices such as game consoles, “baby monitors” (1) and “that smart meter (that) knows when you’re home and what electronics you use when you’re there” (2), for example, will be prolific in the future operating environment. With this in mind, the joint force will have opportunities to use these devices to gain and maintain situational awareness in a mega city or dense urban environment. Before Soldiers enter a building or deploy an unmanned system, they may have opportunities to access these existing “sensors” to build a picture of the building’s interior. Also, being able to access personal electronic devices of the buildings occupants could, coupled with the deployment of unmanned systems, give the Warfighter a better picture of what awaits behind the next door, wall, room or floor. Not only knowing about the location and patterns of life of enemy combatants in the building and the ability to find out where non-combatants are would increase protection of the Warfighter, as well as, reduce the risk of civilian casualties. The data obtained from these connected devices, personal electronic devices and deployed unmanned systems would be rapidly stitched together to render a real-time 3D model of the building, as well as, show locations of the structure’s occupants. An example of this can be seen in the films “Prometheus,” (3) and “The Dark Knight” (4). This would give the Warfighter the needed edge to fight and win in complex urban terrain.

In addition to finding out how many occupants there are as well as their location, the Soldier will also need to gain and maintain situational awareness outside of buildings by being able to access traffic cameras, security cameras and so forth. Building a comprehensive, living model of a city or even a city block would enhance situational awareness and provide the necessary data for leaders to make rapid decisions and increase the protection of the combat element in an operational environment. This composited data could also be shared so that the operational commander would have a real-time view of the area of operations. Big Data Analytics and knowledge management / decision-making tools will be needed in order to filter and make sense of all of the data being obtained.

Of course these connected devices can be used for defensive as well as offensive operations. By knowing where allies and noncombatants are as well as movement of suspect personnel in an area of operations by

target acquisition and tracking of personnel using biometric sensors and software will give the Warfighter the needed information to be lethal, informed, and protected.

A draw back to this is that without power, access to these connected devices may not be possible. Also, if we have the ability to access and use these connected devices then it can be anticipated that the enemy will have this ability, as well. Counter-measures and technologies to spoof, trick or deny enemy access to these devices will also need to be developed.

One of many the challenges in the operational environment is to distinguish between enemy combatants, non-combatants and friendly forces. In order to mitigate fratricide and collateral damage, transponders would need to be developed, that are either worn by the Warfighter or are subcutaneous, which can be picked up by friendly forces. These would need to be visible in different spectra and frequencies.

Vignette

In support of ongoing operations, United States forces have been assigned to rescue hostages held in a high rise building of a dense metropolitan area.

This is part of ongoing operations to remove hostile forces who are attempting to gain control of the capitol building and power grid.

Several hostages have been taken in order to pressure US forces to leave.

Multispectral, visual, as well as audio signals are used to locate the building where the hostages are being held.

As the US forces advance to the building they contact their Cyber Support Center (CSC) utilizing the cyber support officer (CSO) attached to their unit. As the CSC is contacted, unmanned aerial and ground systems that are organic to the unit are deployed.

A call for cyber effects is initiated in order to gain access to the city's security and traffic cameras. This coupled together with the sensors onboard the unmanned systems informs the small unit leader of the best avenue for advance.

Advanced recon to determine patterns of life and develop a target folder are initiated prior to advancement/execution of mission.

Simultaneously, an information campaign to provide a plausible cover story or shape public opinion against the hostage takers and delegitimize their insurgent movement is launched.

Once the safest route has been determined, the US element advances using visual and digital obscurants to cover their movement. A second cyber effect is requested to locate and gain access to connected devices and personal electronic devices in and around the building.

Swarming nano and small unmanned systems are deployed to map out the buildings floor plan and identify location of the occupants. After a few minutes, some cameras are accessed that are built in to game systems, security cameras, mobile phones, smart TV's and baby monitors. Access to these help develop a picture of where the building occupants are located. Two potential locations where the hostages are held are identified based on signals intelligence, cyber effects and the information gathered from the connected devices, mobile phones and unmanned systems.

The US forces enter the building and proceed with caution using the appropriate tactics, techniques and procedures to the two possible locations. After entering the building, US forces talk to a few civilians who have evaded capture and they are able to point out the target location.

A further cyber effect is requested and the location of the hostile forces within the room are identified through their mobile phones, a smart TV and a camera on an office computer. A diversion is created to distract the hostiles and using room clearing procedures, the US forces enter the room, eliminate the threat and rescue the hostages. Less than lethal/area-denial technologies to incapacitate the hostage takers and temporarily neutralize the threat to friendly forces are utilized.

Concluding Thoughts

Gaining and maintaining situational awareness in this age of technology can be challenging. If the Warfighter is left to fight and clear buildings in the same manner, same methods and same technology as seen in the battles of Stalingrad, Arnhem, Nuremburg or Fallujah we have failed.

In conclusion, investments in basic and applied research to develop the necessary technologies and software needed to gain and maintain access to personal as well as connected devices (to include denying access of these same devices to our adversaries) and utilizing elements such as Defense Innovation Unit X in Silicone Valley will be needed to make these concepts a reality.

This paper addresses Army Warfighting Challenge number 1, Develop Situational Understanding (5).

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