

## {CCAT FIRST RESPONDERS TESTING-LA VIDA REAL NARRATION SCRIPT}

On June 7, 2010, firefighters from the San Miguel Fire District in California, tested a personnel locator system that is being developed at the University of Michigan. The locator system, called personnel dead reckoning, or PDR system, uses a small sensor embedded in the firefighter's boot, and a wearable computer to process the sensor data. A radio modem transmits the users position, elevation and heading to the incident commanders computer console. The tests took place in the spacious hallways of La Vida Real retirement complex near San Diego, California. For logistic reasons, tests were limited to the area within the white rectangle. The main purpose of the test was to assess the PDR system's ability to properly handle the diverse types of movement that are frequently used by firefighters.

At the end of the walk, the firefighters real location is shown on the trajectory map and compared with the PDR based position. As was evident on this map, the position error on this walk was less than 3 meters.

The PDR system estimates elevation with average errors of less than 1 meter, even in high rise buildings. At any time, the user's elevation is shown in the elevation window on-screen. Since all three floors have the exact same layout of corridors, we plotted trajectories from all floors over the same generic floor plan.

The PDR system failed to handle belly crawling properly. It showed the firefighter moving backwards instead of forwards. This mode of motion had not been anticipated by the University of Michigan developers, but will be incorporated in the next revision of the PDR system.

The lessons learned from this test include the following:

- The PDR system detected firefighter movements to an acceptable accuracy even during crawling
- There were no problems with standard indoor movement tracking
- the unit did not de-synchronize in an elevator
- Movement is indicated in a timely fashion back to the incident command console
- Boot-located IMU

Areas of weakness included:

- Communication still remains an problem when communicating position data back to the incident command
- The GPS-Denied Systems didn't detect belly crawling, and toe tapping de-synched the IMU
- The setup requires a data cable to connect from the boot mounted IMU to the communications unit inside of the firefighters leg pouch
- Modification of the firefighters boot may not meet OSHA safety standards
- No GPS Unit to assist with personnel location
- The firefighter's own sense of location is not improved, only the Incident Commander knows the location

These are the concluding recommendations:

- Bluetooth data transmission to replace data cable
- Add GPS unit to handoff location computations between IMU and GPS units
- Improve graphical user interface on the Incident Commanders Base Station Computer
- Improve the detection of movement during belly crawling
- Strengthen hardware components to meet the needs of a firefighter's environment
- Provide the firefighter with some positioning orientation integration
- and continue to identify better data communications solutions for multiple environments