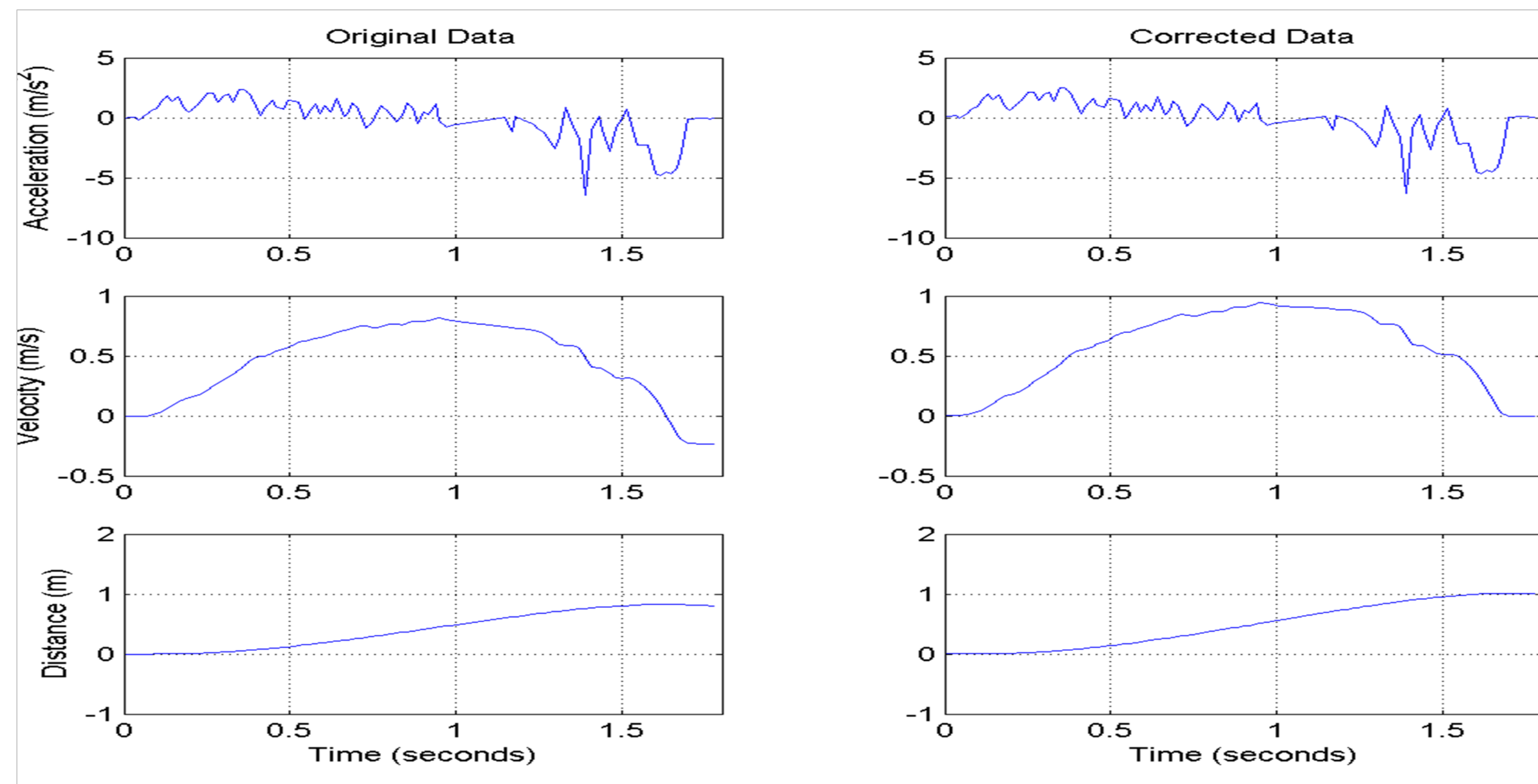


# Localization of Unmanned Ground Systems Using the Zero Velocity Update Technique in the Absence of GNSS



Original (left) and corrected (right) IMU data for estimating position and velocity.

## Approach

- An innovative approach is proposed to improve the position accuracy of inertial navigation systems
- The approach is leveraged on the ability of the zero velocity update (ZUPT) technique to correct drift errors in acceleration measurements
- The ZUPT technique eliminates accelerometer drift errors by recognizing instances of time when motion velocity is known to be zero. It has been successfully applied to pedestrian navigation with inertial sensors
- The application of the ZUPT technique to ground vehicles to improve navigation accuracy will be investigated for the first time

## Motivation

- GNSS/GPS is widely used for navigation of unmanned systems
- GPS signals are susceptible to attack via jamming and spoofing by adversaries
- GPS signals may be obstructed by the environmental elements such as buildings and tree canopies
- Inertial navigation systems (INS) are self-contained, not susceptible to attack, and available anywhere and anytime
- Inertial navigation systems have the inherent drawback of unlimited error growth

## Objective

- To develop technically superior unmanned systems that are always available as an option under any operating conditions, it is critical that unmanned systems are able to navigate when the GPS signals are not available
- The objective is to investigate an innovative approach to improve the navigation capability of INS for unmanned ground systems
- Without adding any new hardware devices to platforms, the proposed approach enables INS to be used for localization of ground vehicles for extended periods of time when GPS signals are not available
- The proposed effort enhances the capability of unmanned ground systems to counter attacks by adversaries