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# SURVEY LINES SYSTEM FOR SAILING

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**Abstract:** Indoor localization and tracking of moving human targets is a task of recognized importance and difficulty. In this paper, we describe a position measurement technique based on the fusion of various sensor data collected using a wearable embedded platform. Since the accumulated measurement uncertainty affecting inertial data (especially due to the on-board accelerometer) usually makes the measured position values drift away quickly, a heuristic approach is used to keep velocity estimation uncertainty in the order of a few percent. As a result,unlike other solutions proposed in the literature, localization accuracy is good when the wearable platform is worn at the waist. Unbounded uncertainty growth is prevented by injecting the position values collected at a very low rate from the nodes of an external fixed infrastructure (e.g., based on cameras) into an extended Kalman filter. If the adjustment rate is in the order of several seconds and if such corrections are performed only when the user is detected to be in movement, the infrastructure remains idle most of time with evident benefits in terms of scalability. In fact, multiple platforms could work simultaneously in the same environment without saturating the communication channels.

***Keywords:*** *Microcontroller,Mems,Compass Sensor,Pc*

## I. Introduction

People localization and, above all, tracking in indoorenvironments are notoriously challenging for various reasons. First, the position accuracy requirements are generally stricter. Second, indoor environments are usually crowded and cluttered with other objects and obstacles, which hamper distance measurements. Finally, in many applications position tracking systems have to be noninvasive, i.e., small and wearable [2]. In addition, while in a positioning system just the location of a target in a certain area has to be determined sporadically or on demand, object tracking requires to measure position continuously and possibly in real-time.

In the last years, many different solutions have been proposed for indoor localization and tracking, but all of them suffer from important limitations. According to [3], none of the existing technologies can assure high performance and low cost, although a well-blended combination thereof can be a key factor of success. Moreover, the definition of the system performance as a baseline for a clear comparison among the different systems is very difficult and radically depends on users' needs, preference, and convenience. For example, in [4] five performance metrics are defined (i.e., accuracy, precision, complexity, robustness, and cost). The authors of [3] add to this set of metrics also security and privacy, user preference and availability. Moreover, in the case of tracking, real-time responsiveness and scalability (when multiple potential targets are in the same environment) are also of crucial importance for performance. The most accurate techniques for distance measurement and positioning are based on laser ultrasonic sensors [5], infrared (IR) sensors [6], rangefinders [7], video cameras [8], or a combination of them [9], [10]. The approach based on the measurement of the time-of-flight (ToF) of ultrasonic signals can be very accurate (i.e., in the order of a few centimeters) when a single target is considered [11], [12], but it is sensitive to the potential interference caused by other ultrasonic generators in the same area and often it is too power-hungry for wearable applications.

## II. The Hardware System

**Micro controller:** This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

**ARM7TDMI:** ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

## III. Design of Proposed Hardware System

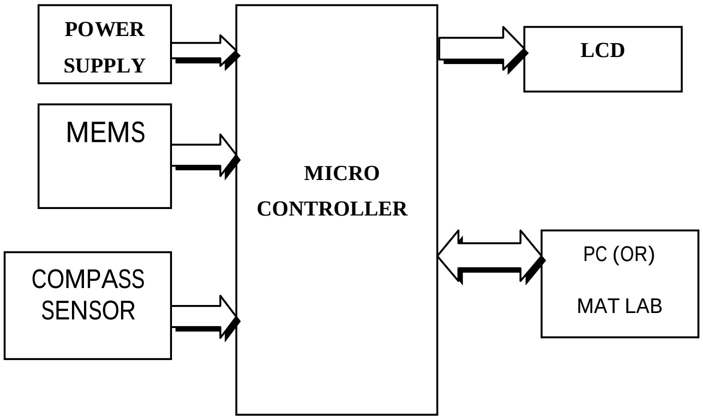

Fig.1.Block diagram

**Liquid-crystal display** (**LCD**) is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

**MEMS:**

Accelerometers are acceleration sensors. An inertial mass suspended by springs is acted upon by acceleration forces that cause the mass to be deflected from its initial position. This deflection is converted to an electrical signal, which appears at the sensor output. The application of MEMS technology to accelerometers is a relatively new development.

**PC Section:** This section basically contains a PC with Serial communication associated hardware. Apart from this, the web cam is also connected to the PC. The serial communication associated hardware circuitry includes the bus (DB 9) connector from PC to Microcontroller.

## IV. Board Hardware Resources Features

### *MEMS*

Micro-Electro-Mechanical Systems (MEMS) is the integration of mechanical elements, sensors, actuators, and electronics on a common silicon substrate through microfabrication technology. While the electronics are fabricated using integrated circuit (IC) process sequences (e.g., CMOS, Bipolar, or BICMOS processes), the micromechanical components are fabricated using compatible "micromachining" processes that selectively etch away parts of the silicon wafer or add new structural layers to form the mechanical and electromechanical devices.

**Microelectromechanical systems** (**MEMS**) (also written as *micro-electro-mechanical*, or *MicroElectroMechanical*) is the technology of the very small, and merges at the nano-scale into nanoelectromechanical systems (NEMS) and nanotechnology. MEMS are also referred to as micromachines (in Japan), or *Micro Systems Technology* - *MST* (in Europe). MEMS are separate and distinct from the hypothetical vision of molecular nanotechnology or molecular electronics. MEMS are made up of components between 1 to 100 micrometres in size (i.e. 0.001 to 0.1 mm) and MEMS devices generally range in size from 20 micrometres (20 millionths of a metre) to a millimetre. They usually consist of a central unit that processes data, the microprocessor and several components that interact with the outside such as microsensors[1]. At these size scales, the standard constructs of classical physics are not always useful. Due to MEMS' large surface area to volume ratio, surface effects such as electrostatics and wetting dominate volume effects such as inertia or thermal mass.

## CONCLUSION

In this paper, a technique for indoor localization and position tracking of pedestrians is described. The proposed technique relies on multi-sensor data fusion and it is implemented on a wearable embedded platform. User position in a given reference frame is measured mainly through inertial data, by cascading two EKFs. The first one estimates the user's attitude in the chosen reference frame, whereas the second EKF returns user's coordinates on a plane. Unlike other solutions described in the literature, the unbounded position uncertainty growth due to the double integration of accelerometer data is mitigated through a heuristic approach that recognizes the steps of the user and removes dynamic velocity estimation drifts. Low-rate position measurements from an external infrastructure (e.g., consisting of camera-based nodes with wireless connectivity) are used to update the state of the second EKF and the yaw angle estimates of the first EKF, to keep positioning uncertainty within specified boundaries. The platform can be worn at the user's waist and can work autonomously with good accuracy (i.e., within about ±50 cm) for several seconds, without any external intervention. This is beneficial in terms of scalability, since multiple platforms could be worn by different users in the same environment, with no risk of interfering with each other. The proposed technique does not claim to be an ultimate solution to the problem of indoor localization and tracking, but it definitely offers a good tradeoff in terms of accuracy, cost and comfort.

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