IJERSS | Volume 2 | Issue 2 | FEB 2015

Research Paper

HUMAN AUTOMATION COLLABORATION OF MULTIPLE UV BASED ON SINGLE OPERATOR USING RESCHU

ELECTRONICS

Keywords: RESCHU,UVs, Autonomous, task based, vehicle based

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ABSTRACT

There has recently been a significant amount of activity in developing supervisory control algorithms for multiple unmanned aerial vehicle operation by a single operator. While previous work has demonstrated the favorable impacts that arise in the introduction of increasingly sophisticated autonomy algorithms, little work has performed an explicit comparison of different types of multiple unmanned vehicle control architectures on operator performance and workload. This paper compares a vehicle-based paradigm (in this method a single operator assigns tasks to unmanned vehicle) to a task-based paradigm (in this method the operator generates a task list, which is then given to the group of vehicles that determine how to best divide the tasks among themselves.) The results demonstrate significant advantages in using a task-based paradigm for both overall performance and robustness to increased workload. The proposed framework incorporates sensor constraints, such as processing and travel time. These results have analyzed and implications for the design of future human-UV systems, as well as more general multiple tasks supervisory control models.

I. INTRODUCTION

In recent years, the use of unmanned vehicles (UVs) has become increasingly prominent.Unmanned aerial vehicles (UAVs), ground vehicles (UGVs), surface vehicles (USVs), andundersea vehicles (UUVs) have been used in applications ranging from military operations toborder security. Unmanned ground vehicles(UGVs) have many potential applications, both in militaryand civilian areas, such as reconnaissance, surveillance, target acquisition, search andrescue, and exploration.Knowledge of UGV behaviours under control commands on different terrain types plays an important role on improving their safety, reliability and autonomy.In this thesis, the complex process involved in a UGV driveline and its interaction with terrain are thoroughlyanalysed and a robust low-level control scheme is developed for driving the autonomous vehicle. Mission and path planning makes use of all known information from prior maps, mission goals , sensory and control structures to generate trajectories, or way points and other actions for the vehicle to execute. However, due to the incomplete knowledge of the world in outdoor missions, the vehicle must use the environment information gathered along the local path to update or rebuild the trajectory. AUnmanned vehicle car (sometimes called a *self-driving car*, an *automated car* or an *autonomous vehicle*) is a robotic vehicle that is designed to travel between destinations without a human operator with the help of software. To qualify as fully autonomous, a vehicle must be able to navigate without human intervention to a predetermined destination over roads that have not been adapted for its use.Autonomous cars will greatly impacton our lives. They will make drivingsafer, more convenient, less energy, intensive and cheaper

II. RELATED WORKS

A significant aspect of the UV control problem is the optimization of a minimum-time trajectory from the UV's starting point to its goal. This trajectory is essentially planar, and is constrained by vehicle dynamics and obstacle avoidance. The previous research summaries as follows [2] proposed the inspection of oil pipeline, [3] explain about search and rescue, [4] allowing the operators or automation to align the sequence of tasks, [5] single operator to perform the scheduling algorithm. Implementation of discrete event simulation is analyses in [6]. [7] Deals with demonstrates the need to incorporate human attention inefficiencies in models of human-UV systems with merits of More accurate predictions for alternative UV.A visualization framework of UAV information constructed from Information Abstraction (IA) was executed in [8].Allowing [9] a single operator to coach a scheduling algorithm resulted in significantly enhanced system performance. This aim of this paper is used to propose a frame work consist of task constraints with task based and vehicle based architecture.

III. TASKS

While the literature work has introduceddifferent analyses on different algorithms for both vehicle- and task-based allocation, a key consistent gap has been a lack of direct comparison between the two approaches. This gap raises the following important research question: how does the incorporation of a higher level of automation resource allocation algorithm impact the workload and performance of the operator in both a task-based and vehicle-based paradigm.The software usedis called Novel Research Environment for Supervisory Control of Heterogeneous

Unmanned vehicles (RESCHU), which allows a single operator the ability to control multiple Uvs. The purpose of the project to implement a multiple unmanned vehicle control system using a single operator. The aim of this paper is to reduce the man power with the help of human automation collaboration. There are two sections in this operation. One is the transmitter part and another section is the receiver section. The receiver section consists of the zigbee transceiver and PC and the transmitter section consist of Mini car model, PIC microcontroller and Ultrasonic Sensor, Battery's. The two methods were analyzed in this project. First method is vehicle based architecture the second method is task based architecture with sensor constraints. In the vehicle based control the user have to handle the each and every steps of vehicle. In vehicle based control the vehicle based architecture the vehicle can able to change the direction. The second method is task based architecture in this method the user have to assign the vehicle to go from source to destination. The vehicles split the best path to go from source to destination.by using this method the vehicle cannot able to stop until it reaches the destination but the vehicle can operated with sensors.

Figure 1- Vehicle based Architecture

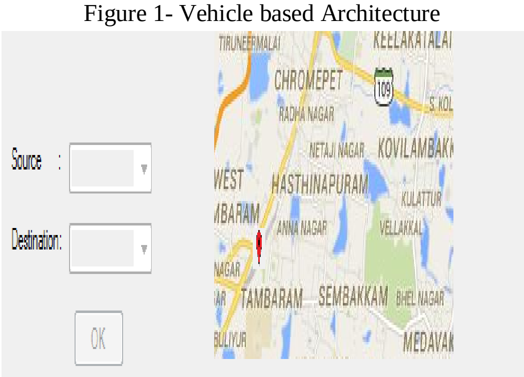

Figure 2- Task based Architecture

The figure 1 & 2 denotes the Vehicle based control and task based control respectively.

IV. IMPLEMENTATION

The Unmanned system programming is divided into three main code levels and its hardware was designed with a hierarchical control structure based on modular microcontrollers. The top level program, carried out in C language, is executed in a remote PC and offers to monitor and control the whole robotic vehicle. The second code level, programmed in C language, runs autonomously on a master PIC16F876A microcontroller. Communication with the remote PC is performed by using a ZIGBEE for the centralized control of vehicle and task based. A precise ***definition of embedded systems*** is not easy. Simply stated, all computing systems other than general purpose computer (with monitor, keyboard, etc.) are embedded systems

Figure 3 explains about the block diagram of proposed frame work transmitter section. Figure 4 explains about the block diagram of proposed frame work receiver section. Figure 5 gives overall circuit diagram.

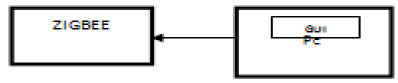

Figure 3- Transmitter section

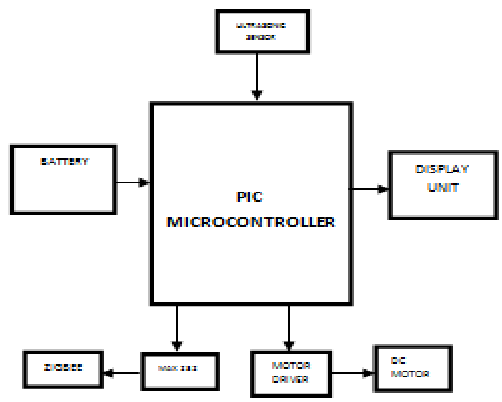

Figure 4- Receiver section

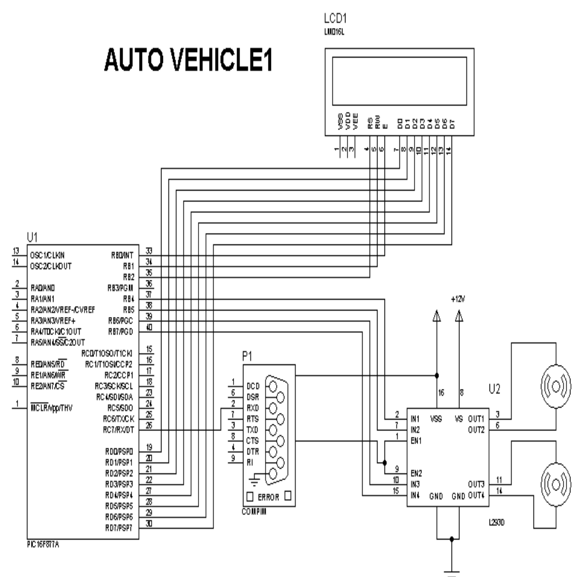

Figure 5- Circuit connections

ULTRASONIC SENSOR

The working of the ultrasonic sensors is quite simple and they are easy to interface with the microcontroller. The sensor module has 4-pins out of which Pin-1 and Pin-4 are +Vcc and Gnd respectively.Pin-2 is Trigger and Pin-3 is Echo pin.The working of sensors can be described from the below figure 6.

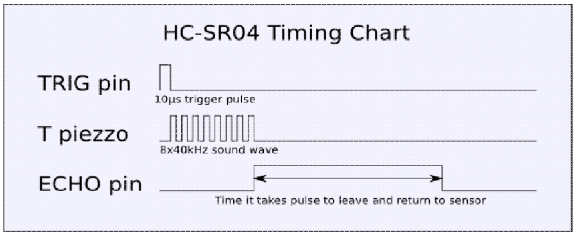

Figure 6 -Ultrasonic sensor timing diagram

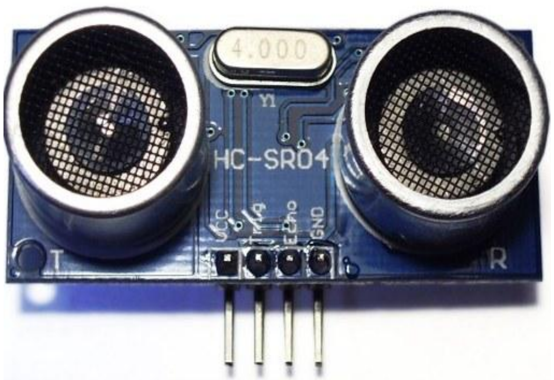

Figure 7– Pin Diagram of Ultrasonic sensor

A microcontroller is a small computer on a single integrated circuit containing a processor core, memory and programmableinput and output peripherals built-inused in the wrist strap unit. The PIC microcontroller is programmed using embedded C language for the operation of the above mentioned taskin this project. In this project the input is taken from the sensors in the form of analog and digital voltages. Each sensor has a dedicated channel.

A. Communication.

Communication between wrist, finger and abdomen units and receiver unit is wireless as shown in fig 7. The data measured by the sensors is saved by building a network between the sensors and to set up a computer receiving and storing the values. For the communication XBee/XBee-PRO ZNet 2.5 OEM RF Modules were engineered to operate within the ZigBee protocol. The moduleswere powered by PIC microcontroller and transmitted in the 2.4 GHz frequency band.The reason for choosing this microcontroller because of its low-power consumption, and built in UART function for serial transmission of data to zigbee module for wireless transmission.

B. ZigbeeModule Overview

These modules provide a possibility to build an easy to configure network, with a high data rate up to 230400 Baud/s. To connect XBee module to the microcontroller is done using four wires as shown in fig 8. ZigBee support three types of network topologies: star topology, peer-to-peer topology and cluster-tree topology. The PHY and MAC layers are defined in the IEEE 802.15.4 (IEEE, 2003) standard while the network and application layers are defined in the ZigBee specification (ZigBee, 2004).

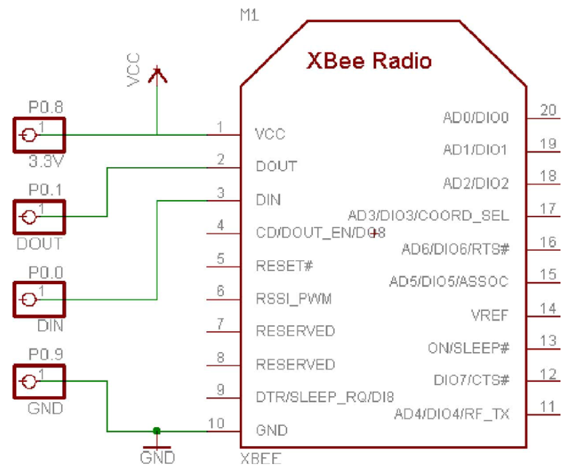

Figure 8-XBee module interfaced with microcontroller

The transmission of the XBee Modules does not provide a checksum or any other possibility to verify the correctness of the received data.

V. RESULTS AND DISCUSSION

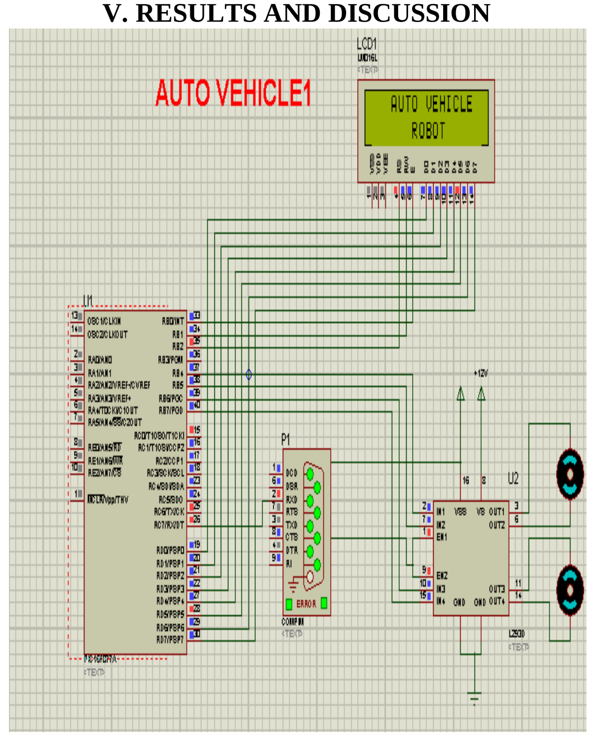

Figure 9-Simulation Result

The figure 10 is the simulation result whereas the Figure 11is the hardware implementation of this project.

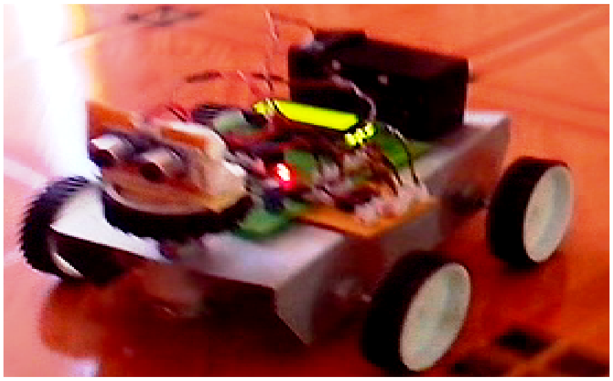

Figure 10-Hardware Model

CONCLUSION

The emergence and performance of the over trusters deserves further attention. Overtrusters ignored the vehicle route replanning functions in both control architectures, effectively over relying on the automation to manage the vehicles appropriately the over trusters, while performing the worst in terms of vehicle damage, performed better than the vehicle based performers in terms of number of targets accurately identified. Information is aggregated for presentation, operators can perform well, but this comes at a loss of control and possibly the ability to manage contingencies and unexpected situations. Consider a 8 types of person to give this unmanned vehicle control using novel RESCHU software. The Time analysis of particular and damage analysis is given below.

A) TIME ANALYSIS

PERSONS	VBA	TBA
A	17	10
B	16	10
C	15	10
D	19	10
F	18	10
E	21	12
H	19	10

B) DAMAGE ANALYSIS

PERSONS	VBA	TBA
A	0.4	0
B	0.2	0.10
C	0.10	0
D	0.3	0
F	0.3	0.10
E	0.2	0
H	0.2	0.10

The damage analysis can be calculated for every 10 vehicles. In vehicle based architecture the damage of vehicle is ratio of every 2 to 3 vehicles in 10 vehicles. In Task based architecture the damage was less when compared to Vehicle based architecture.

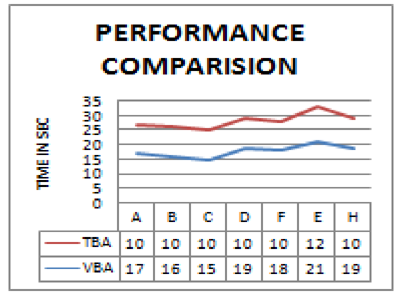

Figure 11-Performance Analysis

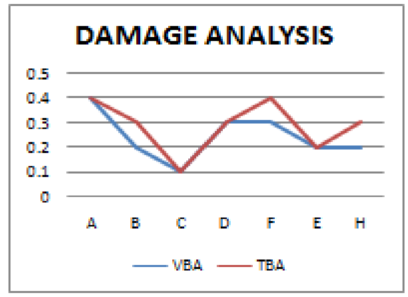

Figure 12-Damage Analysis

Figure 11 and 12 represents the Performance analysis & Damage analysis of both Architectures.

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