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Customizable Tele-Operated Unmanned Ground Vehicle

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Abstract
Unmanned Ground Vehicles will play a very important role in the nation's next generation ground forces. Control of the UGV is accomplished remotely, through a command system that allows an operator to receive sensor data and send motion commands to the vehicle. Being able to modify the UGV as per need will help us enlarge its scope of use.

I.INTRODUCTION

In today's scientific era, technological advancements have picked up great pace. The front runner in this marathon for a truly beautiful technology driven future is a Linux Based System. Its Open Source philosophy has enabled the world to harness and capitalize the greatest minds in the world. This has also made Linux the most advanced operating system available. In such a short duration, the kernel has developed into a magnificent piece of code. Linux provides smooth and swift interaction between the user and his machine. It is a translator of thought into action. By developing Linux Based applications, one can achieve super smart appliances, like unmanned ground vehicles. With the understanding of Linux as a tool we will understand the development of a highly customizable tele- operated unmanned ground vehicle. Another key benefit of Linux is that it allows you to have more control over the system without relying on someone else's Linux implementation. With Linux, you are in the driver's seat and dictate every aspect of the system.

Unmanned Ground Vehicles (UGV) are steadily growing in demand as they will save the humans from performing hazardous and tedious tasks, ground surveillance. UGVs will also play a major role in the next generations ground forces. Despite the major advances in technology, fully autonomous UGVs are far from reality. Currently most of the UGVs are tele-operated which are guided by the humans. Using the tele-operation techniques, one can command the UGV from a relatively safe distance by sending the control and navigation commands wirelessly.

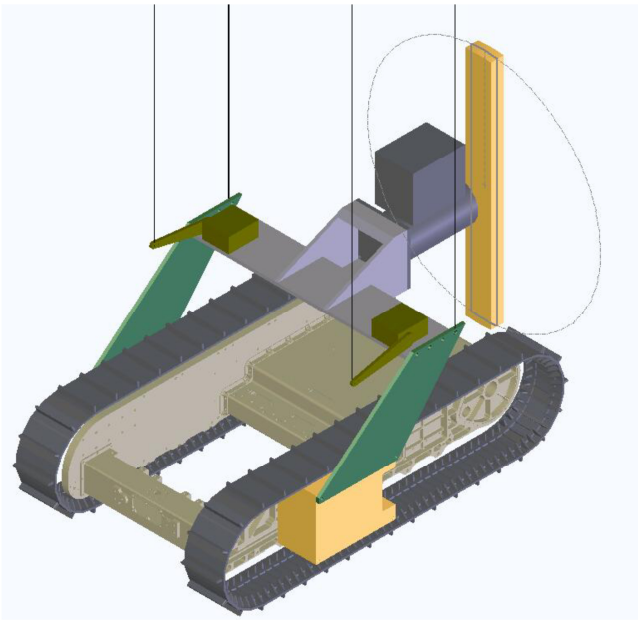

Fig 1. Unmanned Ground Vehicle (UGV)

II.METHODOLOGY

We follow these steps:-
1.Compile a kernel on the x86 architecture.
2.Identify architecture for compiling the kernel.
3.Set up Board Support Packages, RootFS, Filesystem, Toolchain, device drivers, and basic user space programs. We apply these for an application of all of the above for a "need of the market".
4.Testing of the product.

5.Bug Fixing level – I

III.PLATFORM REQUIREMENTS

Hardware Requirements
1. x86/ i386.
2. ARM/MIPS based system.
3. Any basic peripheral devices.
4. Cables for communication that may be used.

Software Requirements
1. Linux distribution.
2. Plain Vanilla Linux source code of 2.6.xx kernel from www.kernel.com .
3. uClibc – Small C standard Library for developing embedded Linux.
4. gcc for host machine.
5.Binary Utilities or binutilis comprise of a collection of programming tools for the manipulation of object file formats. They are typically used in conjunction with GNU compiler collection, make and GDB.
6. Any software stack that we may use

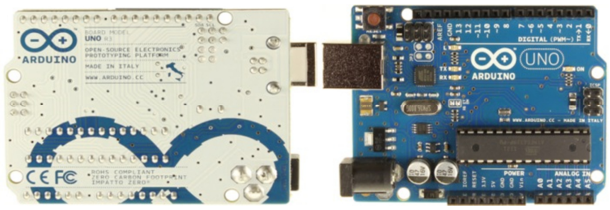

Fig 2. Arduino Board UNO R3

IV. CUSTOMIZABLE UGV AND ITS APPLICATIONS

The Linux operating system coupled with the power of the arm board provides us with an intelligent base that can be customized as per requirement. The UGV has been created using an 8 bit microcontroller that compliments the functionality of the ARM Board that we are using. The camera captures the images and they are wirelessly transmitted by the ARM board to the Host. The ARM Board receives a signal from a host computer via the wireless dongle. The 8 bit microcontroller drives the wireless remote of the toy car. Using the basic setup that we have created, any simple toy car or helicopter or ship can be used to send back live feed. The device can then be controlled remotely and personalized features may be added.

The tele-operated UGV can be used for defense purposes, mining and other places where sending humans maybe hazardous at low costs.

The tele-operated UGV can be sent deep inside mines where it is generally life threatening for humans. The UGV maybe replaced but a human life may not.

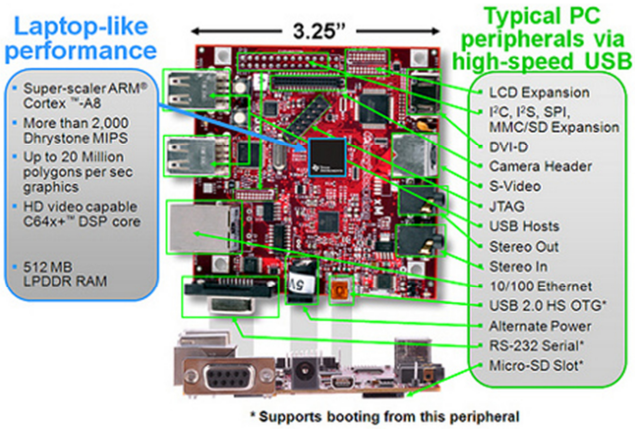

Fig 3. Beagle Board

V.FEATURES

1. Open Source.
2. Easily customizable as per requirement

3. Remotely controlled
4. Wide scope for future development
5. Light weight and easily portable
6. Easy and user friendly

VI.WORKING

1. The UGV is always in listen mode.
2. The host operator receives the live feed sent by the UGV's camera via a wireless dongle.
3. The Operator sends a command to the UGV which is sent via the universal remote.
4. The Beagle Board receives the signal, interprets it and commands the UGV accordingly.

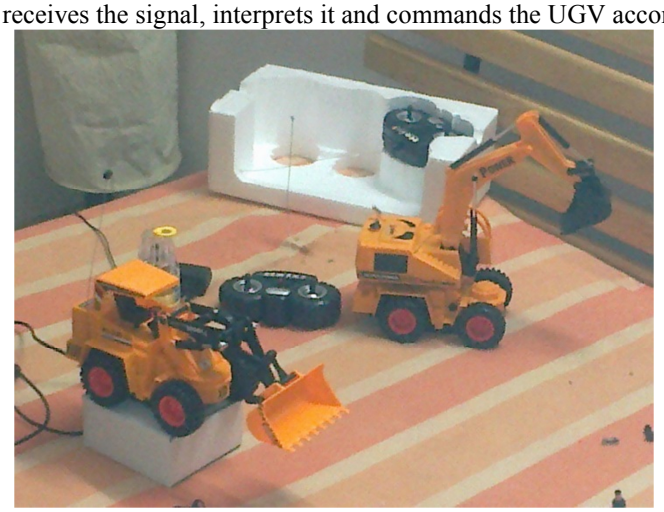

Fig 4. Customizable UGV

VII.CONCLUSION AND FUTURE SCOPE

We hope to provide a safer environment for humans to work in. This is our attempt at providing safety to humans at cheap prices. After the 26/11 attacks in Mumbai, we decided to embark on a journey, that would aid us in providing a way of counter attacking terrorism. Such devices provided with simple shooting mechanisms could have been released with the aim of targeting the menace creators.

As engineers it is our duty to provide sustainable, reliable and innovative ideas to the world.

The Linux kernel and the development of device drivers has a grand scope, the future of technology will be built on its backbone . And with a back so strong, the growth of the human civilization into a science loving community is clear. We are going to make the source code along with the circuit diagrams available freely soon.

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