DESIGN AND FABRICATION OF MULTIPURPOSE UNMANNED GROUND VEHICLE

HEMANTH C REDDY , MADHAN S ,AKSHAT JOSHI, KARUPPUSAMY P DEPARTMENT OF MECHANICAL ENGINEERING, SRI SAIRAM COLLEGE OF ENGINEERING

ABSTRACT

An unmanned ground vehicle (UGV) is actively being developed for both civilian and military use to mainly perform dirty and dangerous activities. Predominantly these vehicles are used to replace humans in hazardous conditions. The UGVs are used in different kind of applications like military, surveillance, security service, riot control, etc. UGVs, in varying sizes to meet mission capability requirement, are today saving lives and providing critical supporting capabilities in current military operations worldwide. They work more effectively in environmental extremes such as heat, cold, or nuclear, chemical and biological contamination.

The automated vehicle works even in off road navigation and mainly used In military and firefighting operations i.e. material handling, fire extinguishing, etc.

Our Unmanned Ground Vehicle (UGV) is operated by motors, a CO_2 based fire extinguisher is used which is actuated by a mechanism developed by us.

The UGV can be operated in all terrains due to the flexible track drive. We have used a wireless remote to operate the UGV.

The main aim of our idea is to introduce an UGV in India that can be used by the Indian Army, Fire Fighters and the police at a low cost.

There is a lot of future scope for this project; the main being an installation of a wireless camera so as to monitor the operation of the UGV.

INTRODUCTION

Due to new developed technology, man is leading a comfortable life. People want each work should be done automatically.

So system called UNMANNED GROUND VEHICLE (UGV)/ROBOTS, comes to exists. UGV as name indicate it operates in contact with ground and without any human resource.

RELEVANCE AND APPLICATIONS

- There are a wide variety of UGVs in use today. Predominantly these vehicles are used to replace humans in hazardous situations, such as handling explosives and in bomb disabling vehicles, where additional strength or smaller size is needed, or where humans cannot easily go.

- Military applications include surveillance, reconnaissance, and target acquisition. They are also used in industries such as agriculture, mining and construction. UGVs are highly effective in naval operations, they have great importance in the help of Marine Corps combat; they can additionally avail in logistics operations on to the land and afloat.
- UGVs are also being developed for peace keeping operations, ground surveillance, gatekeeper/checkpoint operations, urban street presence and to enhance police and military raids in urban settings. UGVs can "draw first fire" from insurgents — reducing military and police casualties. Furthermore, UGVs are now being used in rescue and recovery mission and were first used to find survivors following 9/11 at Ground Zero.
- Civilian and commercial applications
- Agriculture
- Manufacturing
- Mining
- Supply chain
- Emergency response
- Military applications

The current UGV reliability is clearly low. There are some UGVs that have exceptionally high reliability such as the Mars Rover, but the reliability comes at very high financial cost. Furthermore, we do not expect a sudden shift in UGV reliability since the reliability improvement process takes time and the demand for UGVs, i.e. from military or industry, is still far from making UGV mass production possible, with the exception of those used in simple applications such as floor cleaning. Therefore, design for maintainability is important, at least in the near future, to counter the problematic fact that UGVs will fail.

One idea in design for maintainability is that we could use cheaper and lower-reliability robots to complete tasks by providing spare components or even spare robots. The lower reliability robots are used and will be repaired or replaced if some failures occur. The concept of using spare components has been implemented successfully in many applications such as cars, electricity generators, but it is considered new in UGVs.

However, with UGVs' (desired) inherent characteristics, mobile and autonomous, and their (sometimes) extreme operating environments, such as battle fields, high temperature, and low-oxygen sites, UGVs present big challenges in achieving their maintainability.

*1. **Self-diagnosis of faults and fault tolerance***

In order to achieve the objective of operating autonomously in environments where direct human intervention is not feasible, self-diagnosis of faults and fault tolerance are the

characteristics that UGVs must have. With these characteristics, UGVs are expected to be able to, firstly, identify faults by analyzing system data from sensors, and secondly, forecast the propagation of faults in the system, and lastly, propose actions to eliminate or mitigate the effect of the faults.

Reasonably strong growth in spending on UGVs by the Indian government is reflected in a CAGR of 4.2% between 2012 and 2017 being followed by a CAGR of 6.2% from 2017 to 2022. Between 2012 and 2022, sales in India's UGVs marketplace are forecast to grow at a CAGR of 5.2%.

the Indian UGV market will enjoy sustained growth throughout the forecast period. Since the delivery of the Daksh UGV, designed for EOD duties, there has been increased interest by the Indian Ministry of Defence (IMOD) in UGV capabilities, particularly due to the increased challenges faced by the ongoing Naxal insurgency, which is becoming increasingly sophisticated in its employment of IEDs. The main centers of robotics research, headed by the Defence Research and Development Organization (DRDO), have progressed into research specifically catering to the demands of the Indian security forces, including CBRN, RSTA and AC capable UGVs.

The extent of this state monopoly remains a double-edged sword in regard to development and opportunities for outside investment though. With the Daksh UGV programme requiring six years of research and a further three to enter military service, the Indian UGV market lacks the potential for truly dramatic growth seen in other leading national markets. The 2010 announcement of a joint India-Singapore Medevac UGV suggests that the opportunity for large-scale private investment is not yet a realistic prospect for the Indian UGV market.

MARKET

The worldwide market for unmanned ground vehicles (UGVs) will grow five-fold over the next six years, reaching $8.26 billion in 2020 compared to this year's $1.51 billion, predict analysts at market researcher in Dallas.

Driving the UGV market through the end of this decade are technological advancements used to improve the UGV functionality and autonomic decision making capabilities for complex remote operations, analysts say.

In a report titled Unmanned Ground Vehicle Market, analysts break down the global UGV into three applications: defense, homeland security, and commercial. Further, they break down the market by technology, payload, type, and geography.

UGV technologies covered are tethered, tele-operated, semi-autonomous, and fully autonomous. Payloads are fixed and role specific. Types are locomotion, size, weapons, and energy sources. Geographic submarkets covered are North America, Europe, Asia-

Pacific, the Middle East, Latin America, and Africa.

The U.S. and United Kingdom account for nearly 53 percent of the global UGV supply. The U.S., U.K., Germany, and Japan contribute largely to the UGV demand, analysts say. China and India in the Asia-Pacific region are emerging markets.

REFERENCE

[1] Kadoski, T., Rajewski, M., Szczch, L., Walentynowicz, J., *Zasilanie silnika o zaonie samoczynnym paliwem rzepakowym*, materiay Konferencji Naukowo–Technicznej „KONSSPAL 2002".

[2] Baczewski, K., Kadoski, T., Walentynowicz, J., *Problems with introducing a single fuel concept in the load forces*, WAT, Warszawa, 2003.

[3] Stru, M., Kowalski, K., *Cechy uytkowe bojowego wozu piechoty przy modernizacji ukadu dolotowego silnika napdowego oraz zasilaniu paliwem rolinnym*, materiay Konferencji NT „SILWOJ'99", 1999.

[4] Burdziski, Z., *Teoria ruchu pojazdu gsienicowego*, Wki, Warszawa, 1972.

[5] Grab-Rogaliski, K, Szwaja, S., *Hydrogen-Diesel Co-Combustion Anomalies in a CI Engine*, Journal of KONES Powertrain and Transport, vol. 15, No. 3 2008.