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UNMANNED GROUND VEHICLE AND ITS AREAS OF APPLICATION SENSOR TECHNOLOGIES FOR HEALTH MONITORING SYSTEMS

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ABSTRACT

Nowadays there is a variety of autonomous system types in the world. Technological advances within the field of unmanned vehicles aren't limited only to UAVs, more commonly referred to as drones, but they are also increasing within the field of Unmanned Ground Vehicles or UGV, also as surface (aquatic) ones, also referred to as USV. The sector is observing that, technologically, this sort of autonomous systems is progressing faster than it had been expected a couple of years ago [1].

Keywords: autonomous; UGV; teleoperation; emergency situations.

Unmanned ground vehicles (UGV) are robotic systems vehicle that operates while in touch with the bottom and without an onboard human presence. UGVs are often used for several applications where it is going to be inconvenient, dangerous, or impossible to possess a human operator present. Generally, the vehicle will have a group of sensors to monitor the environment, and can either autonomously make decisions about its behavior or pass the knowledge to a person's operator at a special location who will control the vehicle through teleoperation.

The UGV is that the land-based counterpart to unmanned aerial vehicles and unmanned underwater vehicles. Unmanned robotics are being actively developed for both civilian and military use to perform a spread of lifeless, dirty, and dangerous activities [2].

Areas of application

Nowadays, there are a wide variety of UGVs in use. Especially, UGVs 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 [3]. They are also used in industries such as agriculture, mining and construction [4].

UGVs are also being developed for peacekeeping operations, ground surveillance, gatekeeper/checkpoint operations, and urban street presence and to enhance police and military raids in urban settings.

Space Applications

Two UGVs, Spirit and Opportunity that performed beyond the original design parameters were used in NASA's Mars Exploration Rover project. This is attributed to redundant systems, careful handling, and long-term interface decision making [5] Opportunity (rover) and its twin, Spirit (rover), six-wheeled, solar powered ground vehicles, were launched in July 2003 and landed on opposite sides of Mars in January 2004. The Spirit rover operated nominally until it became trapped in deep sand in April 2009, lasting more than 20 times longer than expected [6]

Civilian and commercial applications

Multiple civilian applications of UGVs are being implemented to automatic processes in manufacturing and production environments [7]. They have also been developed as autonomous tour guides for the Carnegie Museum of Natural History and the Swiss National Exhibition Expo [5].

Agriculture

Agricultural robots are one type of UGVs that use in the agriculture field. Unmanned harvesting tractors can be operated around the clock making it possible to handle short windows for harvesting. UGVs are also used for spraying and thinning [8] They can also be used to monitor the health of crops and livestock [9].

Manufacturing

In the manufacturing environment, UGVs are used for transporting materials [10]. They are often automated and referred to as AGVs. Aerospace companies use these vehicles for precision positioning and transporting heavy, bulky pieces between manufacturing stations, which are less time-consuming than using large cranes and can keep people from engaging with dangerous areas [11]

Mining

UGVs can be used to traverse and map mine tunnels. Combining radar, laser, and visual sensors, UGVs are in development to map 3D rock surfaces in open pit mines [12].

Supply chain

In the warehouse management system, UGVs have multiple uses from transferring goods with autonomous forklifts and conveyors to stock scanning and taking inventory [13].

Emergency response

UGVs are used in many emergency situations including Urban search and rescue, fire fighting, and nuclear response. Following the 2011 Fukushima Daiichi Nuclear Power Plant accident, UGVs were used in Japan for mapping and structural assessment in areas with too much radiation to warrant a human presence [14].

Military applications

UGV use by the military has saved many lives. Applications include explosive ordnance disposal (EOD) such as landmines, loading heavy items, and repairing ground conditions under enemy fire [3]. BigDog, a quadruped robot, was being developed as a mule that can traverse difficult terrain.

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Transportation

Vehicles that carry, but are not operated by a human, are not technically unmanned ground vehicles, however, the technology for development is similar [3].

Conclusion

In conclusion, UGVs are widely used in the above-mentioned applications. With the help of these vehicles, huge advances are being made in modern robotics. The development of such technologies can be seen as a solution to problems in a variety of fields.

References

1. https://www.embention.com/news/ugv-professional-use-applications-functions/
2. https://en.wikipedia.org/wiki/Unmanned_ground_vehicle
3. Gage, Douglas (Summer 1995). "UGV HISTORY 101: A Brief History of Unmanned Ground Vehicle (UGV) Development Efforts. Unmanned Systems Magazine. 13 (3).
4. Hebert, Martial; Thorpe, Charles; Stentz, Anthony (2007). "Intelligent Unmanned Ground Vehicles". Volume 388 of the series The Springer International Series in Engineering and Computer Science. Springer. pp. 1–17. doi:10.1007/978-1-4615-6325-9_1. ISBN 978-1-4613-7904-1.
5. Nguyen-Huu, Phuoc-Nguyen; Titus, Joshua. "GRRC Technical Report 2009-01 Reliability and Failure in Unmanned Ground Vehicle (UGV)"
6. Wolchover, Natalie. "NASA Gives Up On Stuck Mars Rover Spirit". Space.com
7. Khosiawan, Yohanes; Nielsen, Izabela (2016). "A system of UAV application in indoor environment". Production & Manufacturing Research: An Open Access Journal. 4 (1): 2–22. doi:10.1080/21693277.2016.1195304.
8. Tobe, Frank (2014-11-18). "Are ag robots ready? 27 companies profiled". The Robot Report.
9. Klein, Alice. "Cattle-herding robot Swagbot makes debut on Australian farms". New Scientist.
10. Borzemski, Leszek; Grzech, Adam; Świątek, Jerzy; Wilimowska, Zofia (2016). Information Systems Architecture and Technology: Proceedings of 36th International Conference on Information Systems Architecture and Technology – ISAT 2015. Springer. p. 31. ISBN 9783319285559. Retrieved 12 September 2016.
11. Waurzyniak, Patrick. "Aerospace Automation Stretches Beyond Drilling and Filling". Manufacturing Engineering.
12. "More robots, inside and outside the warehouse". Transport and Logistics News.
13. Siciliano, Bruno; Khatib, Oussama (2016). Springer Handbook of Robotics. Springer. ISBN 9783319325521.