

## Bachelor's Thesis, Term Project

# Design and Fabricate a Smart Autonomous Monitoring Systems of Railway/Monorail for Smart Cities

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The proposed monitoring tool will provide the required input for inspection processes and maintenance programs with the aim to **improve the life-cycle** of the railway track system for increasing its sustainability.

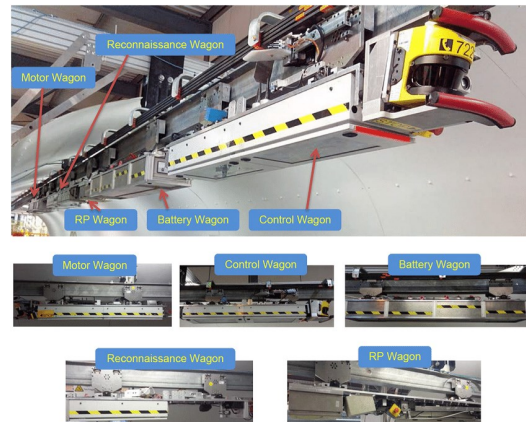
The designed tool is a solution that will use a **sustainable and renewable power supply source** based on solar energy capturing technologies. The main targets of the proposed system, as shown in the above figure, are:

**Environmental targets** - including: a) use of a low carbon power source (i.e, a renewable energy source based on solar capturing technologies); b) rail noise reduction by improved preventive maintenance system through monitoring of the track parameters.

**Social targets** - including: a) improved safety in rail transport; b) increasing the railway track reliability and availability.

**Economic targets** – including: a) reduction of track maintenance costs; b) reduction of overall track LCC; and c) added value to overall UK economy.

The project will be in collaboration with the Civil Engineering department and there is other students in the Civil Engineering Department will be working with you.



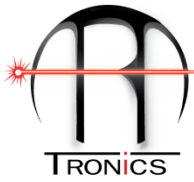
**Fig.:** A Smart Autonomous Monitoring Systems of Railway/Monorail

### Project description and objective:

The integrated approach is based on the application of innovations in measurement techniques and technologies using laser and accelerometer systems in the monitoring of important track parameters focusing on remote measurements of: displacements, moments, torsion and acceleration of the track system components. The novel monitoring system design is intended to be an autonomously powered

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system using renewable energy, suitable for use in a wide range of geographical locations, including those without connections to mains electricity and wired communications networks. This will be achieved by using state-of-the-art power supply systems based on solar capture technologies, to ensure a fully optimised and integrated solution for the designed monitoring tool. For this purpose, a collaboration has been established and agreed with a local SME, SOLAR CAPTURE Technologies, with relevant expertise in the field of solar technologies to deliver a properly. Designed and engineered solar powered system that can offer a viable alternative to mains electricity for track system monitoring devices

### Research focus of this project:

- Literature review on the project should be studied properly.
- Not only, creating a software control system for the project but also the hardware.
- Experiments using the gadget and control system should be built properly.
- The outcomes must be documented.

### Requirements:

- Passionate to learn more about, Automation, Sensing Design, 3D Printing design, Robotics and control.
- Prior mechatronic design expertise is desired like "SolidWork".
- Enthusiasm for completing actual practical work with 3D printing staff (design fabrication and construction).
- A method of working that is both structured and self-contained.

### General tasks of the project:

- The complete methodology is already available in the ARATRONICS Lab, so we will discuss it from the first day to start the automation process for it
- Fabricate the robot/system using 3D printer/CNC machine (small parts).
- Assembly all parts of the System.
- Changing the working variables and see the effect on the system.

### Other notes:

- A weekly meeting with the advisors will be required for this project, as well as weekly progress updates (*The meeting could be more than once during the week based on your progress and based on your achievements*).
- You should to be in the Lab two days per week (*It could be more than two days based on your progress and based on your achievements*).
- All reports must be prepared in the style of a research paper.
- The outcome of this research will be published in one of the coming international Conferences and , or Journal