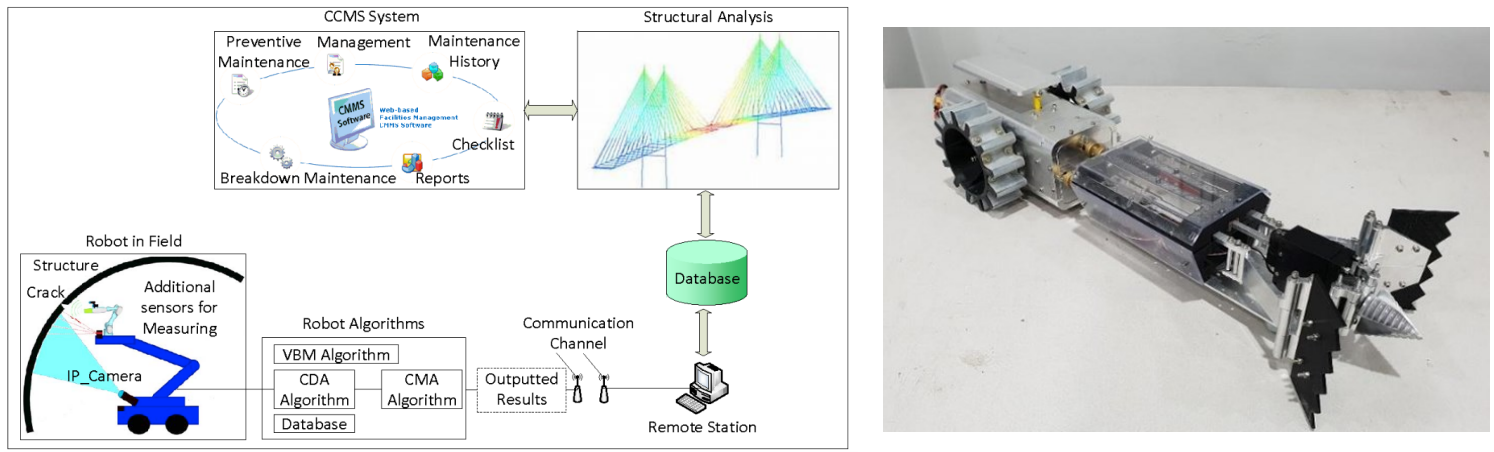


## Bachelor's Thesis, Term Project

# Robot with Embedded Sensors for Structural Health Monitoring

**Supervisor (s):** (Assist. Prof. Dr. Eng. Amir Roushdy)  
(Assoc. Prof. Dr. Eng. Amr ElNemr) from Civil Engineering Department

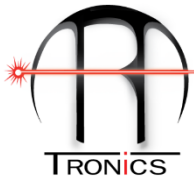
Structural systems are susceptible to damage throughout their operational lifetime. Thus, structural health monitoring technologies and, in particular, Robots embedded with sensors that could monitor structural performance and detect damage are needed. While there exist a variety of different sensing platforms, this continues to be an active area of research due to the many challenges associated with identifying and quantifying structural damage, which is inherently very complex. **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.:** Autonomous robotic system for SHM

### Project description and objective:

The development of Structural Health Monitoring (SHM) system that directly measures the displacement of the structure using low-cost sensors can be very helpful. In this project, Inspection of defects in infrastructure has been a constant field of research. In the majority of inspections, a technician is responsible to go physically to the field in order to detect and measure defects. Through the measurement results, engineers are able to perform the Structural Health Monitoring (SHM) of a measured structure. In this project, a fully architecture of an autonomous system is proposed with the goal to automate the SHM task. The proposed system uses an autonomous robot, database and the proposed architecture to integrate all sub-systems for the



automation of the SHM. Experimental results validate the technical feasibility of the proposed system. The proposed system is expected to act also as a visual inspection and active sensing system if the mobility of the robot is utilized.

### 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 3D Printing design, Robotics and control.
- Prior mechatronic design expertise is desired like "SolidWork and Arduino".
- 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 Robot.
- Changing the working variables and see the effect on the robot.

### 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