A PROJECT TO PREVENT OVER-WEIGHTED TRAFFIC LOAD ON BRIDGES

Motivation: Each year several roads especially the bridges are being collapsed due to the over-weighted traffic load. An automated over-weight vehicle detection system can decrease the number of incidents of road and bridge collapses significantly.

Objective: The goal of the project is to use Arduino based hardware components to solve the aforementioned issue.

Critical Challenges: TBA.

Conflicting requirements: TBA.

Figure 1. *The collapsed bailey bridge at Kutukchari Bazar area in Rangamati sadar upazila on January 12, 2021 (-* ***Dhaka Tribune)*** *(link)*

*- **A truck loaded with stones climbed the bridge at around 6:30am on Tuesday and suddenly fell into the river when the bridge collapsed. (- Dhaka Tribune on 12/1/21)***

Figure 2. Cracks develop on bridge of Dhaka-Aricha highway on January 14, 2021 (link)

- A lane of Dhaka-Aricha highway, on Savar's Salehpur bridge, was closed after cracks developed in its girder yesterday afternoon. (- The Daily Start on 14/1/21)

Some components of Complex Engineering Problem:

Knowledge Profile (K) [**K –short name]**
K1–natural sciences
K2 –mathematics
K3 –engineering fundamentals
K4 –specialist knowledge
K5 –engineering design
K6 –engineering practice
K7 –comprehension
K8 –research literature

Attribute	**P1 and some or all of P2 to P7:**
Depth of knowledge required	**P1**: one or more of K3, K4, K5, K6 or K8
Range of conflicting requirements	**P2**: wide-ranging or conflicting technical, engineering and other issues
Depth of analysis required	**P3**: no obvious solution
Familiarity of issues	**P4**: Involve infrequently encountered issues
Extent of applicable codes	**P5**: outside problems encompassed by standards and codes of practice
Extent of stake-holder involvement and conflicting requirements	**P6**: diverse groups of stakeholders with widely varying needs
Interdependence	**P7**: many component parts or sub-problems

Let's explore how a few P's could be addressed through this project

P1 (***Depth of knowledge required- one or more of K3, K4, K5, K6 or K8***): This project needs the study of related works having the same goal like our project (**K8-** *research literature*), designing the project with hardware components (**K3-** *engineering fundamentals*, **K5-** *engineering design*), decide which sensors to use among various choices to ensure sustainability (**K4-** *specialist knowledge*), Developing an App for the project (**K6-** *engineering practice*).

P4 (***Familiarity of issues- Involve infrequently encountered issues***): This project solves an engineering problem which IS deeply associated with civil engineering faculty.

P6 (***Extent of stake-holder involvement and conflicting requirements- diverse groups of stakeholders with widely varying needs***): Diverse group of stakeholders (usually all the citizens of Govt. of Bangladesh who uses bridges as their route) will be benefited by this project.

P7 (*Interdependence- many component parts or sub-problems*): Project involves two subsystems mainly:

1. Hardware (sensor- based) model
2. Application model
3. Data analysis on the inputs (real time data) of this project [extension.]

List of activities (As)

Attribute	Some or all of the following:
Range of resources	A1: use of diverse resources (include people, money, equipment, materials, information and technologies)
Level of interaction	A2: resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues
Innovation	A3: creative use of engineering principles and research based knowledge in novel ways
Consequences for society and the environment	A4: consequences in a range of contexts, characterized by difficulty of prediction and mitigation
Familiarity	A5: Can extend beyond previous experiences by applying principles-based approaches

Let's explore how a few A's could be addressed through this project

Attribute	Some or all of the following
Range of resources	**A1 (*Range of resources*):** Project needs to engage diverse resources including people, money, information and technology.
Level of interaction	**A2 (*Level of interaction*):** A good level of interaction is needed among the students, the construction practitioners, Government office (Ministry of Road Transport and Bridges of the Govt. of Bangladesh), Bridge and Road Construction Companies and the participants.
Consequences for society and the environment	**A4 (*Consequences for the society and environment*):** Making habituated with the new system will be an challenge to the project. Creating awareness among the frequent bridge construction companies and users could be introduced as a part of the project.
Familiarity	**A5 (*Familiarity*):** Solving a structure related problem will be a new challenge for a CSE students.

CSE 316 (Peripheral and Interfacing Lab)

CO-PO mapping of CSE 316 (Peripheral and Interfacing Lab):

CO-PO	Assessment tool
CO1-PO (a) Engineering Knowledge	Lab Performance
CO2- PO (c) Design/ Development of solutions	Presentation and Documentation
CO3-PO (e) Modern Tool usage CO3- PO (i) Individual and Team work	Lab Performance Presentation and Project update
CO4- PO (f)- The engineer and society CO4- PO (h)- Ethics CO4- PO (j)- Communication CO4- PO (k)- Project Management and Finance CO4- PO (l)- Lifelong Learning	Project and Documentation Viva and Project Documentation (Motivation and business plan) Presentation Documentation Viva (Describing a relevant scenario and taking the response of the student)

Addressing the complex engineering problem components through an example project.