The following is the guideline for the term project proposal format:

* The project proposal should not exceed 1 page.
* Every project will start with the title of the project, team name, and authors.
* The project proposal should include:

1. introduction of the problem you want to solve, explain the significance of the problem why it is important to solve it); and indicate the method you used to solve it. It is also highly recommended to add a concept figure showing the overall idea behind the method you are presenting.

2. How do you propose to solve it?

3. Project Milestones: Dates and sub-goals

4. References.

* The project proposal needs to be submitted in PDF format.

Topic ideas:

* Try new or interesting vision techniques in construction
* Compare two or more approaches

Specific ideas (though it is always the best and more fun to work on your own idea):

* Multiview reconstruction for construction elements: improve reconstruction for challenging construction elements, e.g., thin steel structure, painted white wall...
* Construction object detection: build construction object detectors and apply them to construction safety, and productivity. Objects could be tools, equipment, or resources.
* Synthetic data augmentation: use BIM, 3D models to create datasets for training deep learning networks
* Worker tracking: track workers, equipment on the site and analyze the relationship
* Photo organization: build a system that can organize the photos by location, people
* Activity recognition: build a system to analyze construction activities
* Schedule knowledge formalization: make a knowledge base for the construction sequence (schedule)
* Material classification: try to classify construction materials

**Automatic Height Calculation Leveraging Vanish Point Detection**

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1. **Introduction**

Many deep learning methods have been helpful tools for construction progress monitoring and construction safety inspection. Furthermore, to acquire the position data of a particular object, point clouds are usually used. However, it is time-consuming whether the segmentation point clouds are generated using 2D Image Segmentation and back projection or if it is generated using the 3D point cloud segmentation method.

We are proposing a method that automatically detects straight lines and predicts the location of the vanishing points. In addition, we will capture standard lengths using some common objects. By doing so, we can calculate (1) the height of any object in an image or (2) the position of the camera itself. First, it could be further applied with other deep learning methods like Image Segmentation or Object Detection and get the height position without generating the point cloud of the entire construction site. Secondly, for images taken from the interior of the building, we could get the height information if the image contains enough information about the roads and buildings outside.

1. **Method**
   1. Vanishing Point Detection
      1. Detect line segments: RANSAC
      2. Compute intersection of lines
      3. Classify line segments of different vanish points
      4. Acquire the line representing ground plane
   2. Standard Length Detection
      1. Image Segmentation or Object Detection of standard length
      2. Mark line segment in image
   3. Acquire Floor Information of Object (image taken from outside)
      1. Calculate actual height: Cross Ratio Method
   4. Acquire Floor Information of Camera (image taken from inside)
      1. Focus solely on the lines outside of the building
      2. Calculate actual height: Cross Ratio Method
2. **Project Milestone**

| 4/17 | 4/24 | 5/1 | 5/8 | 5/15 | 5/22 | 5/29 |
| --- | --- | --- | --- | --- | --- | --- |
| Vanishing Point Detection | |  |  |  |  |  |
| Data Collection | |  |  |  |  |  |
|  | Standard Length Detection | |  |  |  |  |
|  |  |  | Height Calculation | | |  |
|  |  |  |  |  | Final Presentation | |

1. **References**
   * 1. Non-Iterative Approach for Fast and Accurate Vanishing Point Detection

<https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5459328>