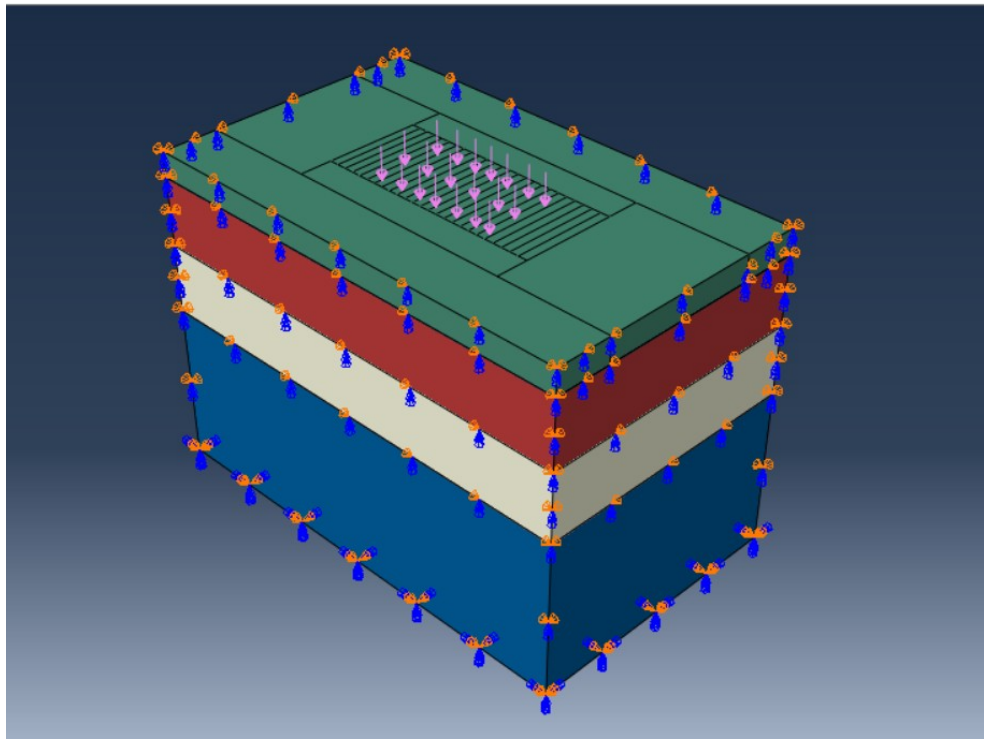
Pavement Damage Analysis and Performance Evaluation Under Overloaded Vehicles in Nepal



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INTRODUCTION

Problem Statement

The frequent loading and unloading of pavements with varying intensity and speeds makes their quality and strength deteriorate quickly.

Failure is accounted by:

- poor construction materials
- Overloading of vehicle
- faulty design

This research project aims to **quantify** the **damage** caused **by the overloads** in the roads of Nepal as well as to **close the gap** in **analytical research** of the pavement responses to the **major overloaded vehicles** i.e, **trucks** under **various speeds.**

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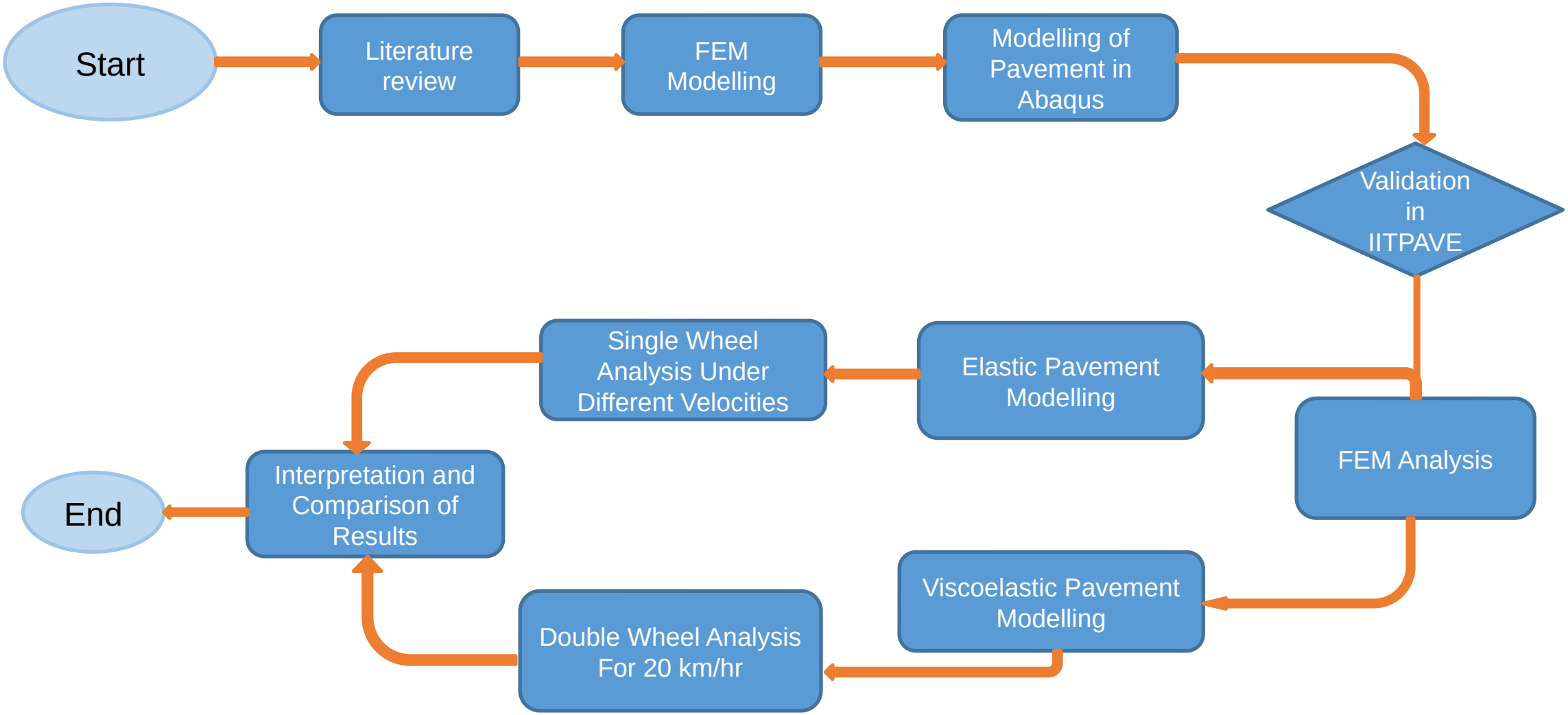
Organization

- Our Project can be divided into three major parts:

1. Pavement Design
2. FEM Analysis
3. Analysis of Pavement Damage

FEM ANALYSIS

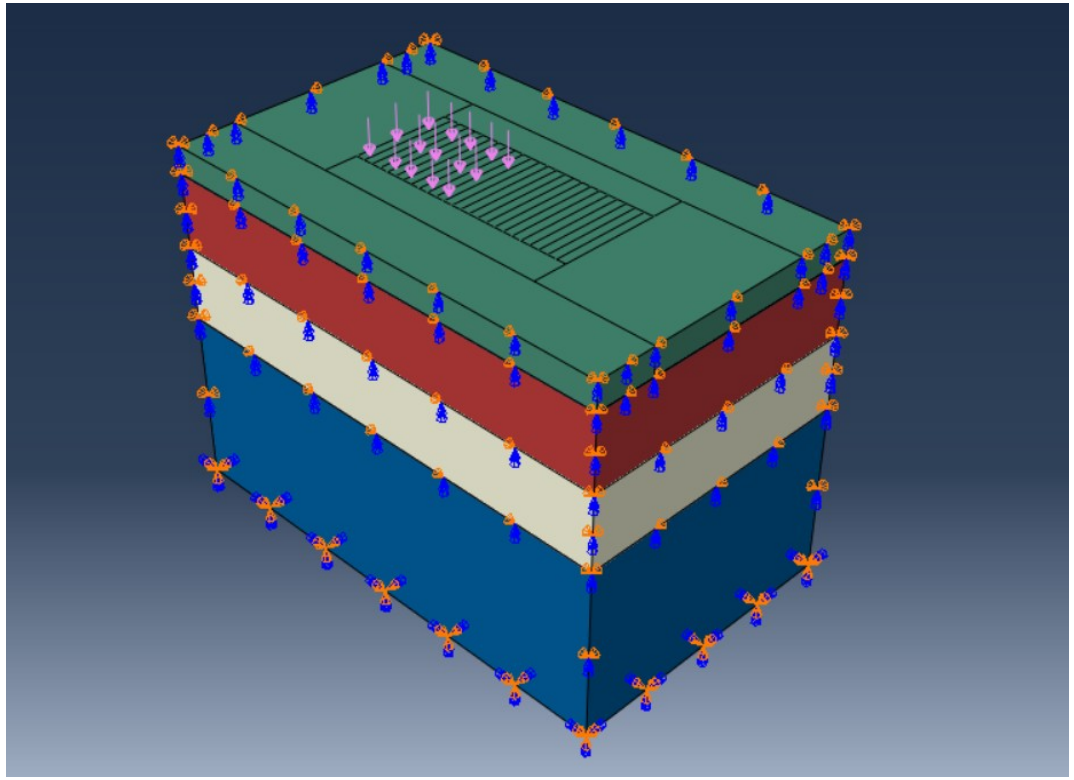


FEM ANALYSIS

- **Part Module** → Create Part→3D Deformable → Extrusion → Draw Cross Section → Input Depth
- Part Module → Create Datum Plane: Offset from Plane→ Select offset Plane → Choose Direction → Input Offset Distance
- Part Module → Partition Cells: Use Datum plane → Select cells to Partition→ Select Datum Plane
- **Property Module**→ Create Material→ Input Property(elastic, viscoelastic and density)
- Property Module → Create Section(Solid Homogeneous)→Select Material
- Property Module → Assign Section → Select 3D Geometric Section → Select Section

Model Description

- Dimensions of 1.5×1.2×1.410m
- Four Layers, Asphalt, Base, Subbase and Subgrade
- Load was simulated as uniform pressure of 0.758MPa over an area of 0.600×0.416m



Validated Model

- Similar to our main model, but static load is considered
- The discrepancies are between 2% and 6% between the values obtained by ABAQUS and IITPAVE

Parameter	IITPAVE	ABAQUS	Error
Depth of 0.110m			
Displacement (uy)	1.559	1.596	-2.37%
Vertical Compressive Stress (σ_y)	0.6151	0.651	-5.84%
Horizontal Tensile Strain (ε_z)	0.3739	0.39	-4.31%

