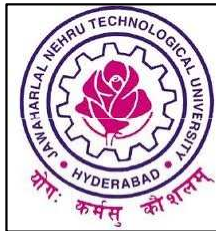


# WEB BASEDCAMPUS INFORMATION AND NAVIGATION SYSTEM USING G.I.S.



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***India Geospatial Forum 2013***  
***24 Jan 2013 @ HICC, NOVOTEL, Hyderabad***

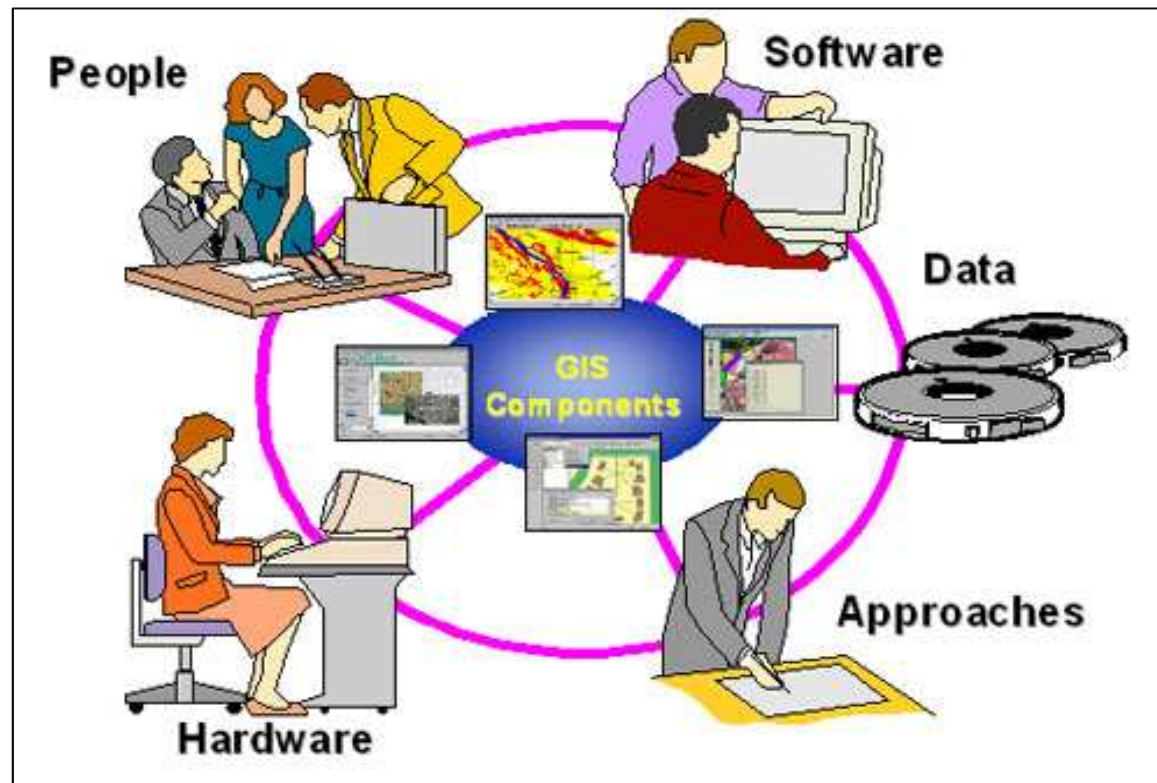


# Presentation Outline

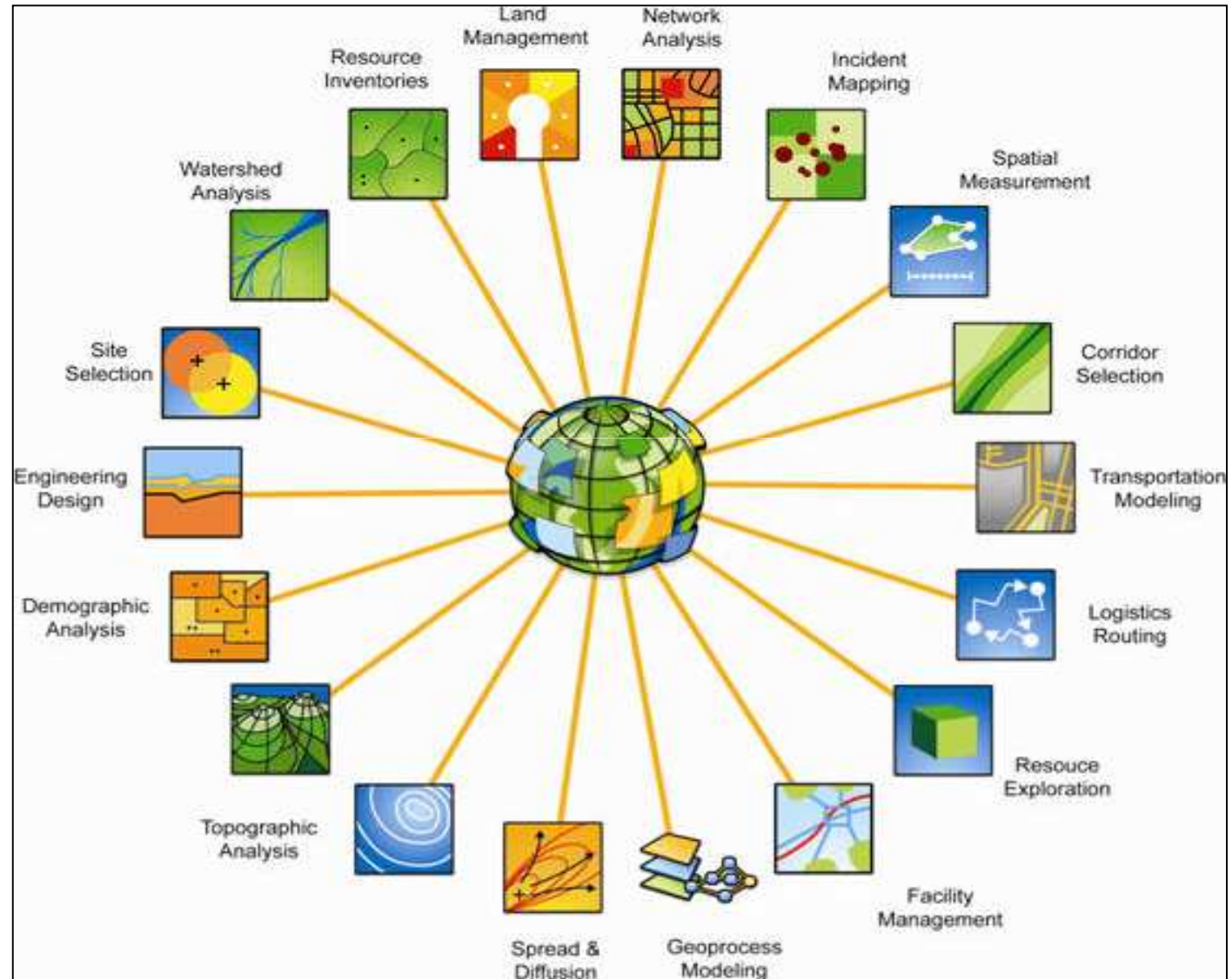
- Introduction
- Study Area
- Methodology
- Model Development
- Overview of ArcGIS Server
- Results and Discussion
- References

# Introduction

- G.I.S. is a system designed to store, manipulate, integrate, analyze, manage, and represent various map/image (geographic) layers along with associated data
- Used to answer questions specific to spatially referred maps and their associated data.



# G.I.S. Applications





## Objectives

- 1) Create geo-referenced map of IIT Hyderabad Campus using G.I.S. environment (from Master Plan and GCPs)
- 2) Create Network datasets for roads (and pavements) of the campus
- 3) Develop network based geo-processing tool (using Model Builder) to perform “distance based shortest route” search
- 4) Create and publish a web application using ArcGIS Server for use with intranet users to
  - Read and analyze map features
  - Search a department / Staff / Student
  - Find shortest route between two (or more) points
  - Print Driving directions along shortest route
- 5) Couple web G.I.S. features with ITS through wireless communication for secured management of vehicular movement within the campus (***Proposed***)

## Study Area – I.I.T. HYDERABAD

- One of the Seven New I.I.T.'s initiated by Ministry of HRD, Government of India in 2008
- Campus located near 'Kandi' Village in Medak District on NH-9
- Geographical Area ~ 550 Acres
- Geographical Boundaries:
  - 17°34'50.06" N and 17°36'10.49" N Latitudes
  - 78°07'05.12" E and 78°07'38.44" E Longitudes
- Faculty Strength: ~ 90 (now) & ~ 200 (projected by 2020)
- Students Strength: ~ 750 (now) & ~ 2000 (projected by 2020)
- Geology: Archaean Peninsular granites and gneisses form the basement, which is overlaid by the Deccan basalt
- Meteorology: Semi-Arid with hot summers and mild winter



## Study Area (Contd..)



**Master Plan of I.I.T. Hyderabad to Scale (Source: Executive Engineer IIT H)**

# Methodology

- Create Polygon / Polyline Shape files in Arc Catalog
- Input the GCPs (taken with Handheld GPS) into Arc Map through a 'comma separated value' file
- Geo-reference the Raster Image with respect to GCPs
- Digitize all Shape files at highest possible scale using 'Snap' feature
- Specify attributes to objects, features, and areas
- Develop Network Dataset for Road features
- Develop the shortest route algorithm using in ArcGIS Model Builder
- Develop customized geo-processing tools to perform search / query analysis on various polygon features
- Create a Web Application in ArcGIS Server for use with intranet users



# Methodology – Digitization

## *Co-Ordinate System*

Geographic System : WGS 1984

Projection Type: Conformal

Projected System: UTM 41 North

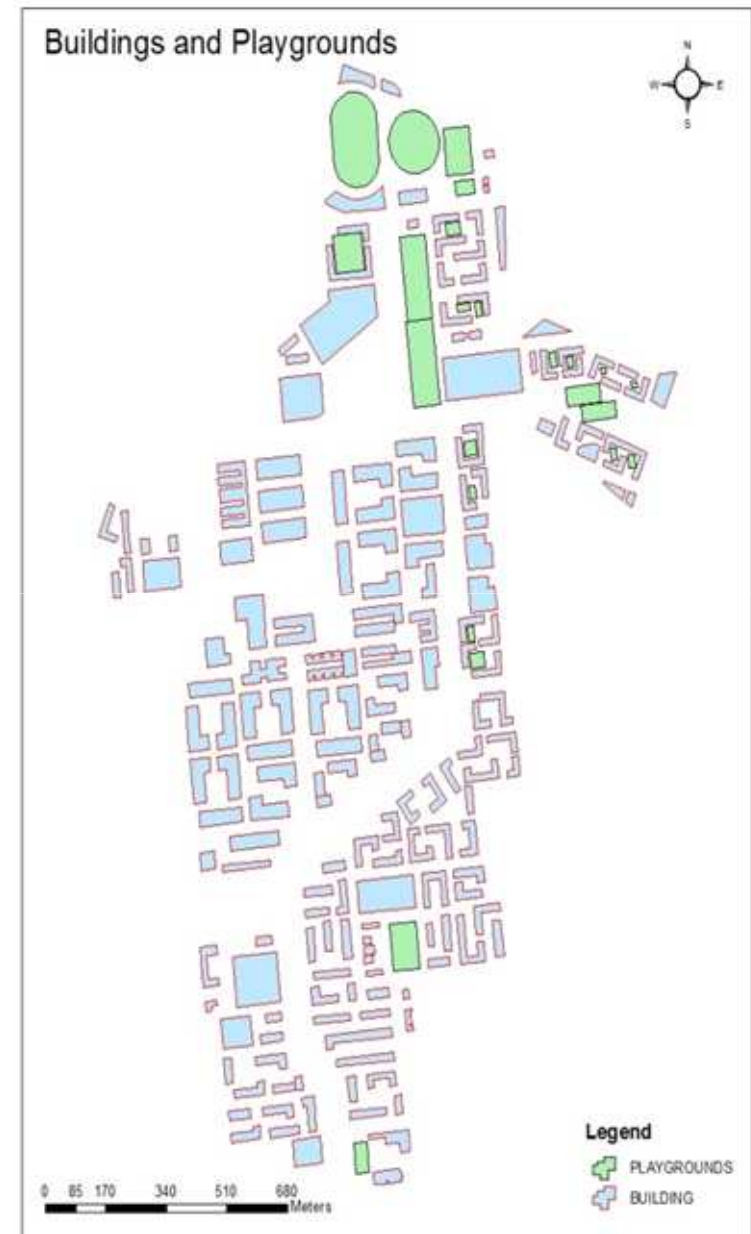
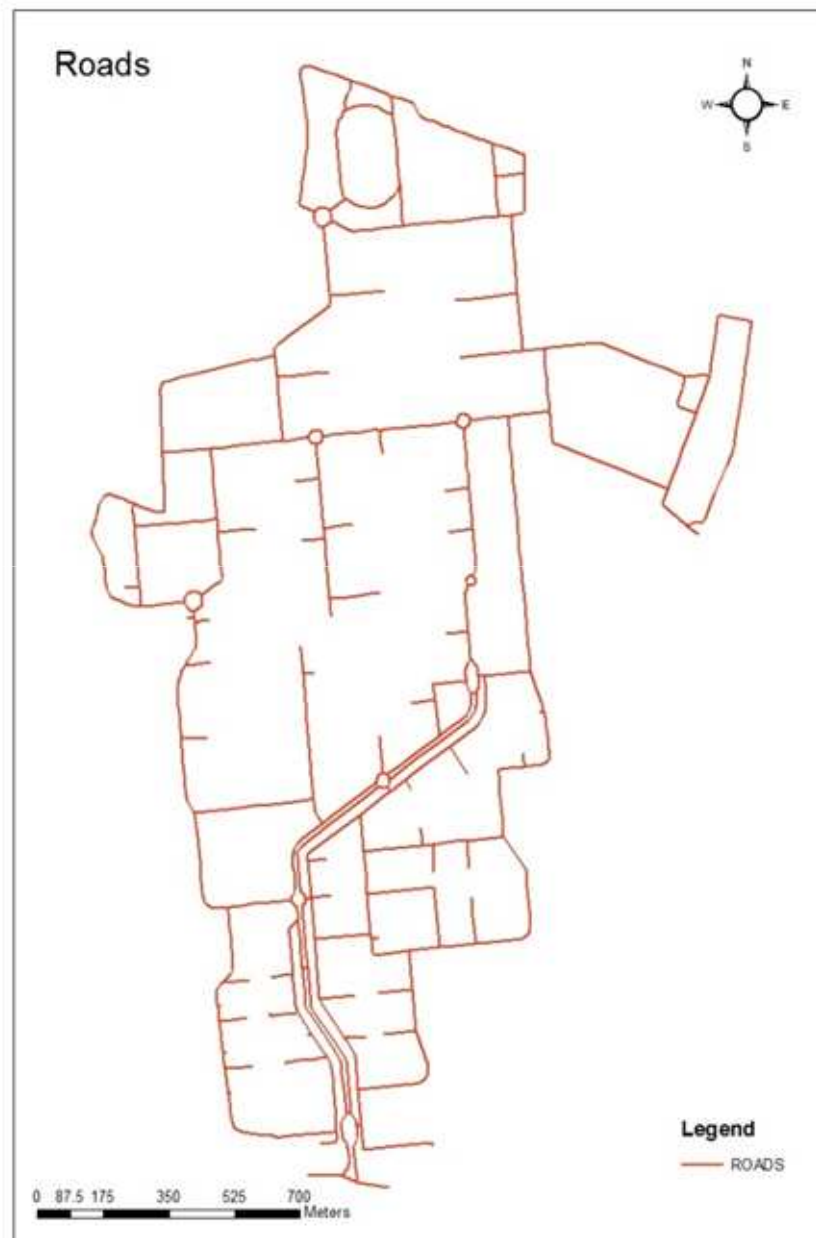
Preservation: Angles and Shape

Map Units: Meters

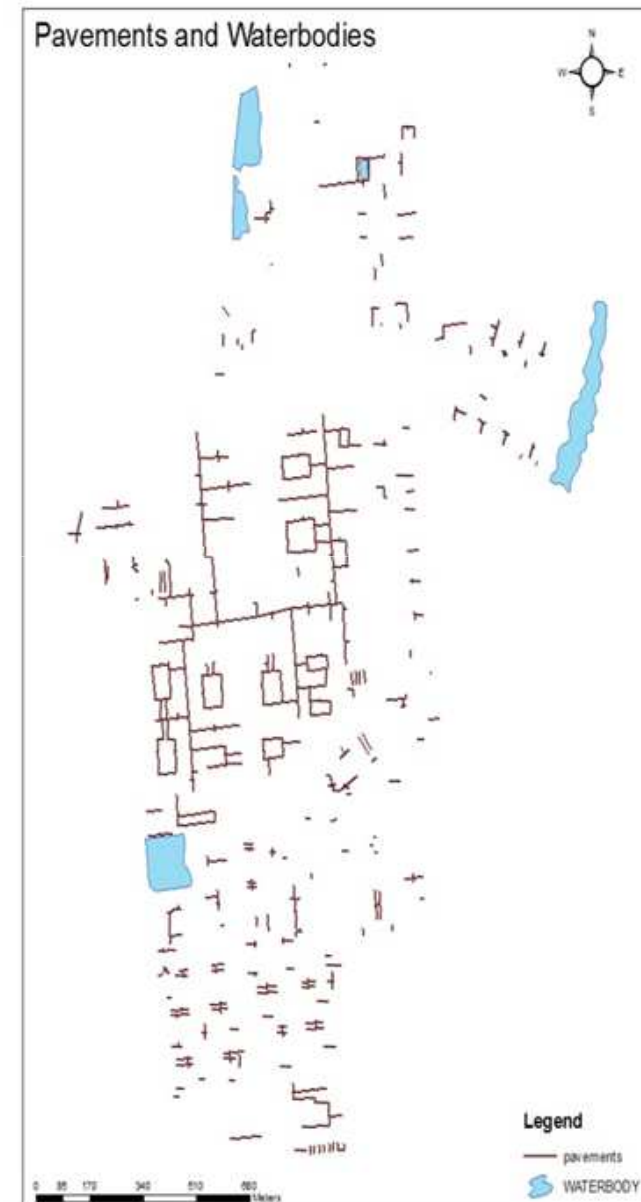
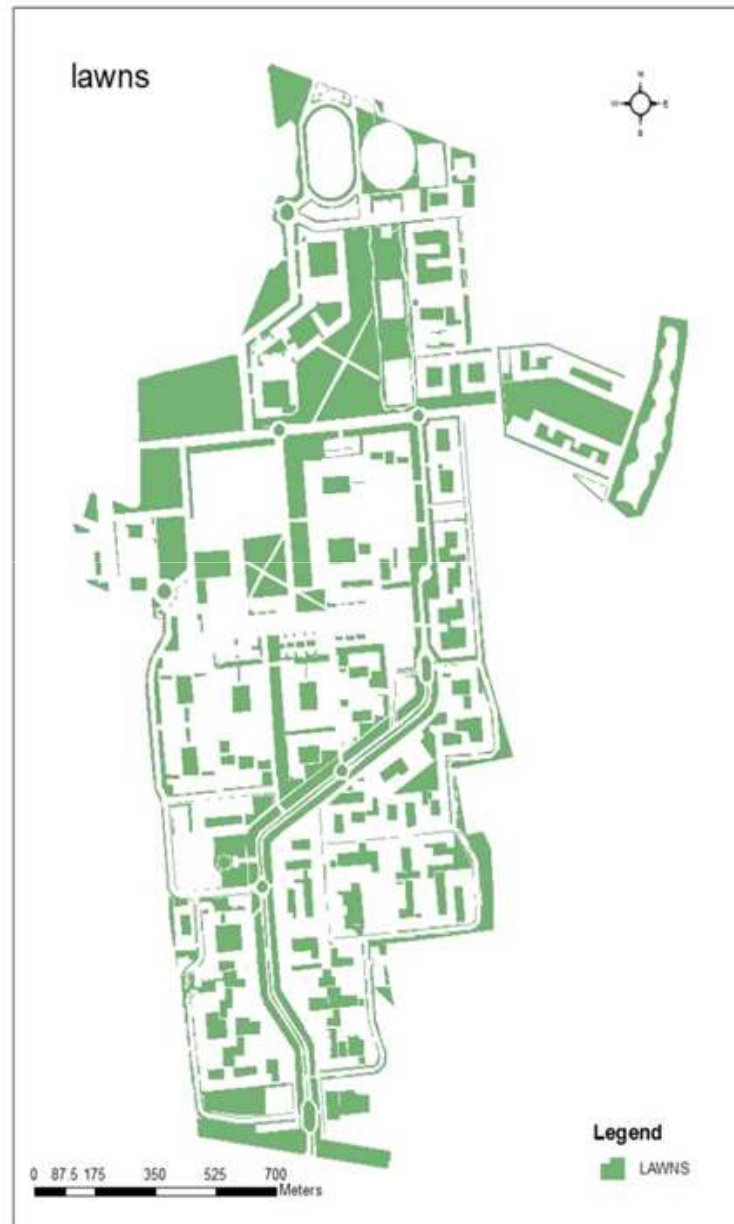
## *Digitization*

- Create Shape Files (of required nature)
- Use 'Editor' tool to digitize (based on Raster Image) to delineate various features
- Use 'Snap to vertex' tool for digitization (polylines)
- Calculate 'Geometry' for area/length calculation
- Geo-reference the raster images (with 4 GCPs)

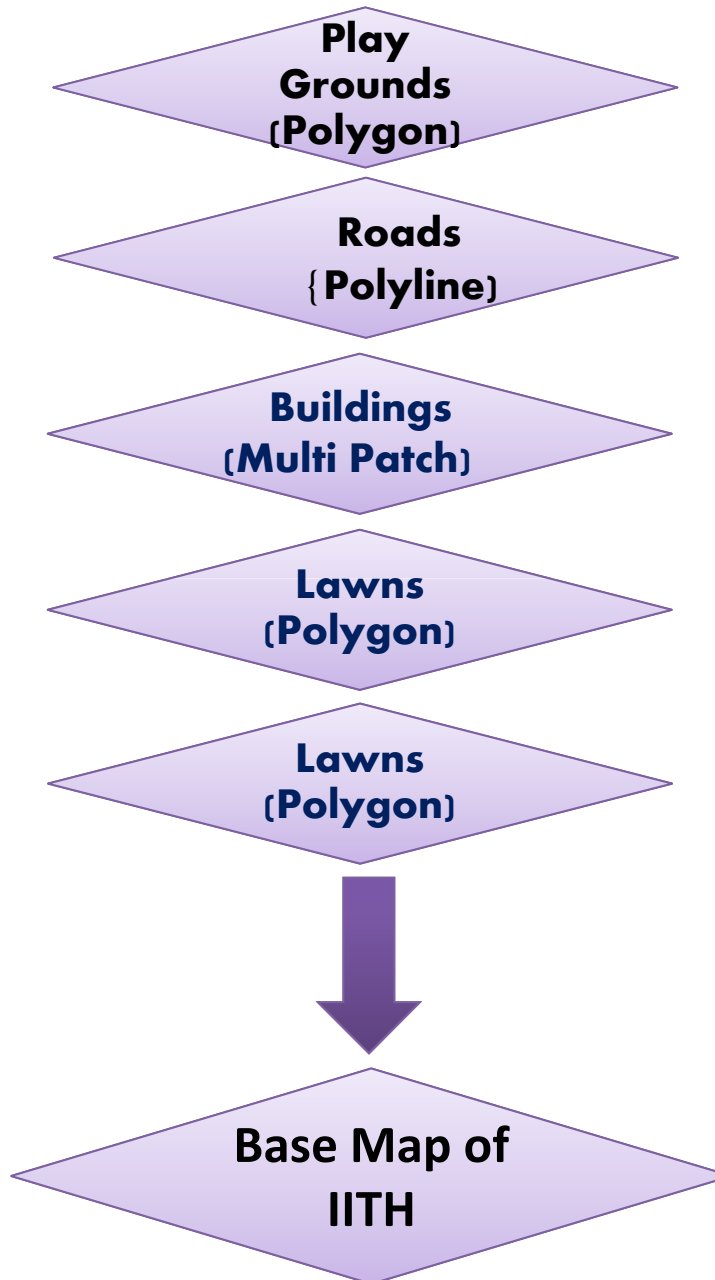
## Methodology – Digitization (Contd..)



## Methodology – Digitization (Contd..)



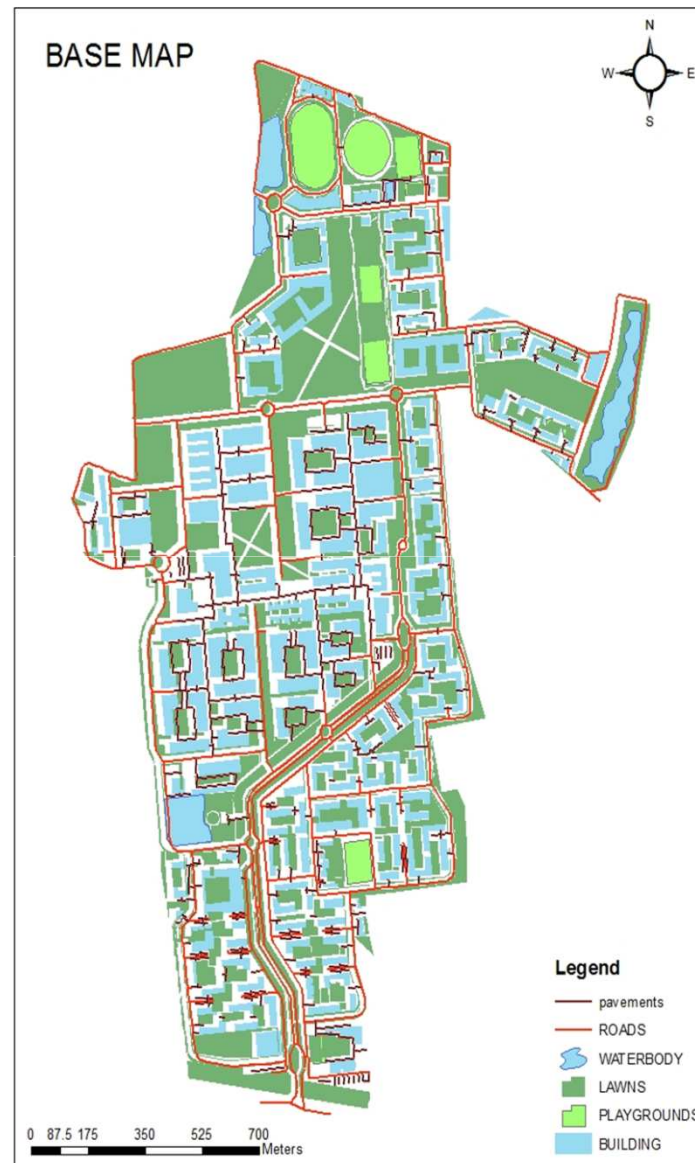
# Methodology – Map Overlay



## Methodology – Network Analysis

- Use 'Network Analyst' tool in Arc Map to create Network Dataset (ND) of Roads / Pavements
- Specify the following attributes create a 'ND'
  - Shape Length; Speed Limit; Time; Global Turns; One-way restrictions
- 'ND' will create 3 shape files:
  - Edges; Junctions; Polyline (roads/pavements)
- 'ND' can serve the following analysis:
  - Optimum Route Analysis
  - Service Area Polygon generation
  - Closest Facility Service
  - OD Cost Matrices

# Methodology – Base Map in G.I.S.

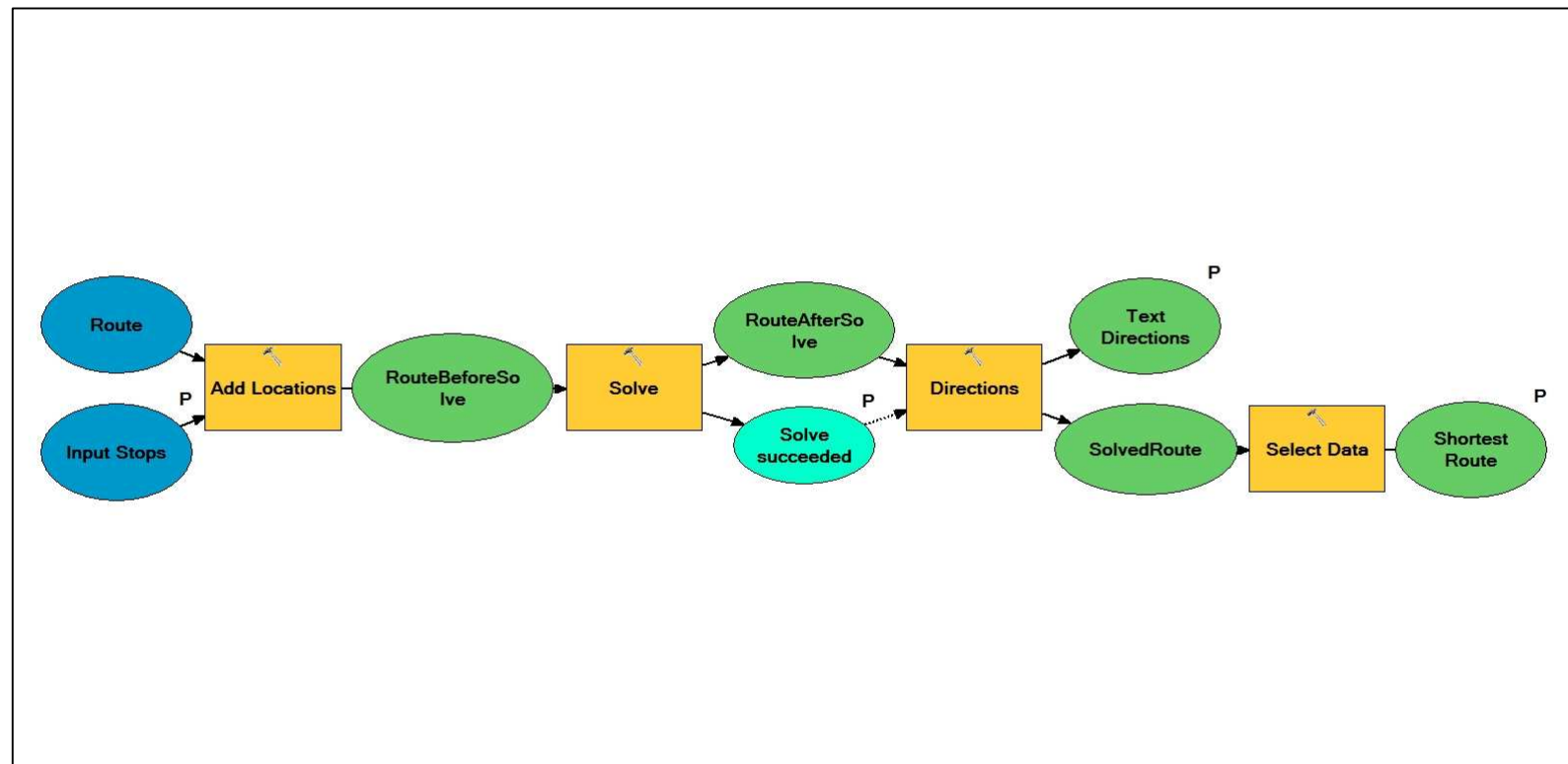




# Model Development

- ArcGIS Model Builder was used to develop the customized application for delineating the shortest route (and directions)
- Input Features:
  - Route → ND Feature class
  - Stops → Parameter
- Tools Used:
  - Add Locations (to add stops interactively)
  - Solve ND (for shortest route)
  - Directions (to provide directions)
  - Select Data (to output to ArcGIS Server)
- Output Features:
  - Network Layer (Shortest Route)
  - Directions (in txt format)

## Model Development (Contd..)



### *Model to Calculate Shortest Route for IIT Hyderabad*

- ArcGIS Server was used to publish the G.I.S. resources onto web/internet
- ArcGIS Server has 'Interactive Features' for customized applications
- Steps Involved: Add GIS resource (and associated tools); Publish GIS resource



## Results and Discussion

Web based Campus Information and Navigation System (CINS) developed for IIT Hyderabad campus can be used for

- ✓ 2-D Visualization of the Entire Campus (to scale)
- ✓ Identify specific features (buildings/people/units/roads/grounds)
- ✓ Search for various attributes (departments/staff/students)
- ✓ Calculate 'shortest route' between two or more points (lying either on or off the roads)
- ✓ Print the driving directions between specified stops (locations)
- ✓ Query for non-spatial information, and link to spatial maps
- ✓ Zoom / Print the map (overall or selected)
- ✓ Get the shape areas / lengths / perimeters of various features
- ✓ Measure length / area / perimeter interactively

## Results and Discussion (Contd..)

### In-Built Tools Used by ArcGIS Server

#### ➤ General Features:

Zoom in / out

Pan

Full Extent

Magnify

Measure

Go to location

Identity

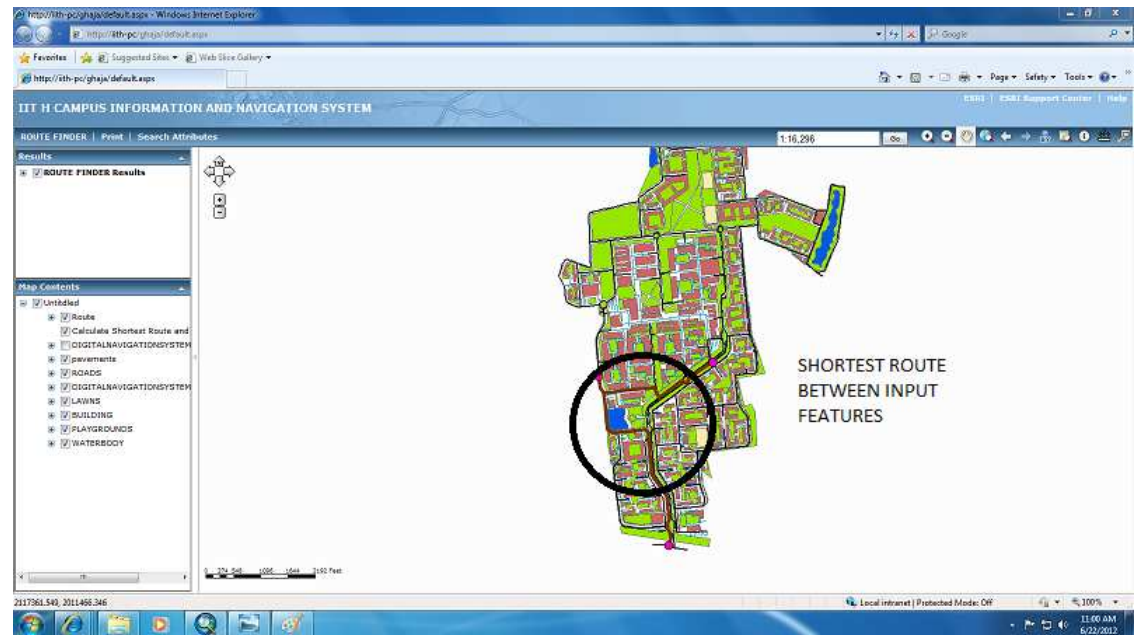
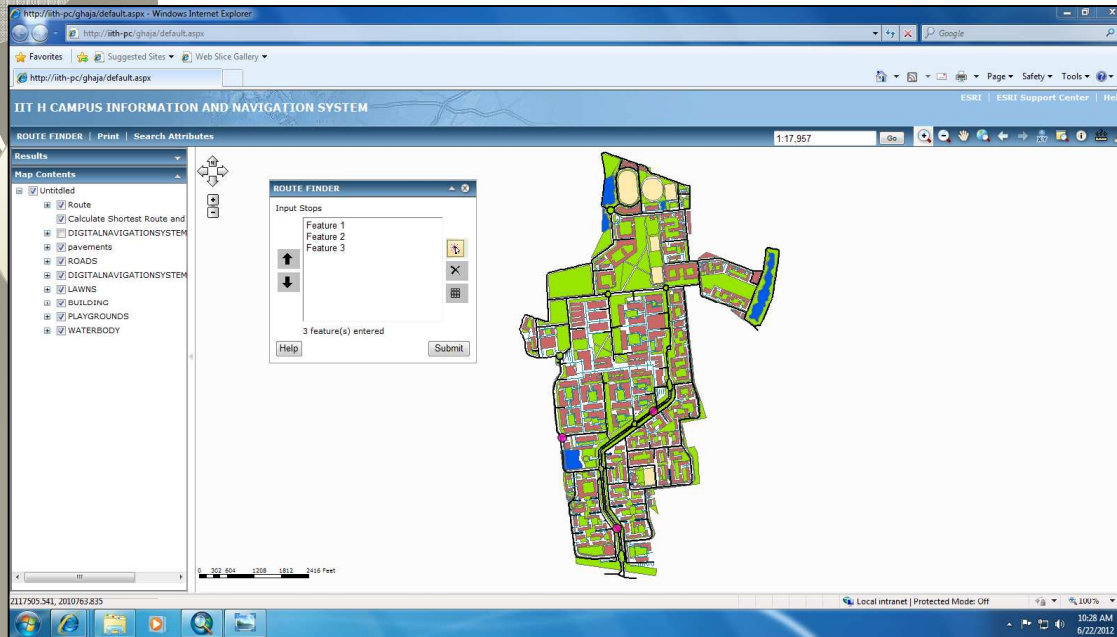
#### ➤ Customized Tools Developed for the Campus

Find Shortest Route (and get directions)

Print the Map (with geo-processed results)

Search Various Attributes

# Results and Discussion (Route Finder)



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