Course: GMT 107
Geological Mapping and Surveying

Surveying

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Grading System

This course will be graded as follows:-

S.N	Descriptions	Marks
1	Class Attendance	10%
2	Class Test + Assignments	15%
3	Written Exam	75%

Structure of lectures

➢ Modular

➢ There will 5 main modules

➢ A module will describe a major chapter

➢ Each module will consists of lectures (1 to 6)

➢ Designed in such a way that individual modules can be checked and will be asked for assignment

Structure of lectures (21+4)

Module	Descriptions	Lectures
1	Introduction of Geo-informatics	1
2	Basic concepts of Surveying	6
3	Measurements	5
4	Map Projection	4
5	Mine Survey	5
6	Practical (GMP-111b)	4

Objective & Outcomes of the course

- ✓ You would be able to understand the Basic Surveying
- ✓ You would be able to apply surveying techniques and equipments in real life problems
- ✓ You would be able to conceptualize how to use a set of tools for problem solving in an optimal way
- ✓ You would be able to understand the pitfalls so to avoid these

Introduction of Geoinformatics

- ✓ Definitions
- ✓ Major activities of surveys
- ✓ Geoinformatics
- ✓ GIS

Objective of the lecture

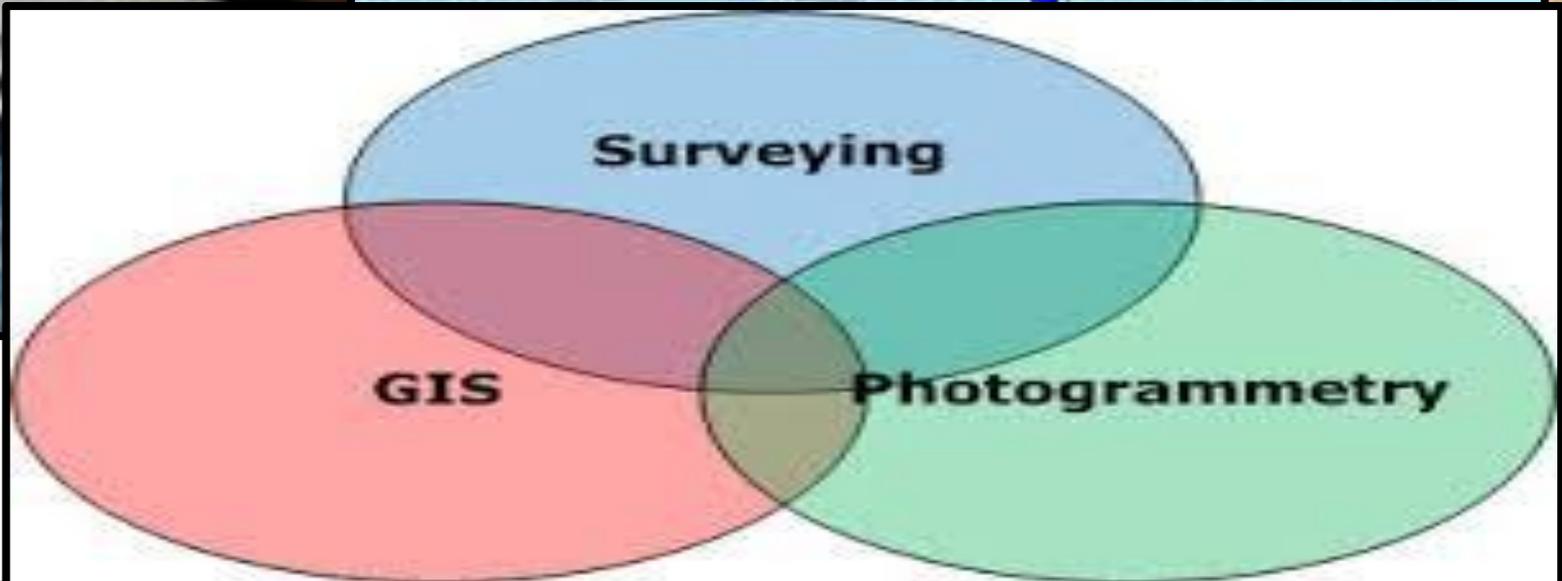✓ To know about general & mine survey.

✓ To know the principal activities of surveying

✓ To develop a general concept about Geoinformatics.

✓ To know very basic of GIS.

Module1   Lecture 1

Introduction:

Geo-informatics

Introduction

Survey is the to look closely at or examine (someone or something).

Survey is the way to examine and record the area and features of (an area of land) so as to construct a map, plan, or description.

Mine surveying is a branch of mining science and technology. It includes all measurements, calculations and mapping which serve the purpose of ascertaining and documenting information at all stages from prospecting to exploitation and utilizing mineral deposits both by surface and underground working.

Surveying is defined as "taking a general view of, by observation and measurement determining the boundaries, size, position, quantity, condition, value etc. of land, estates, building, farms, mines etc. and finally presenting the survey data in a suitable form". This covers the work of the valuation surveyor, the quantity surveyor, the building surveyor, the mining surveyor and so forth, as well as the land surveyor.

Another school of thought define surveying "as the act of making measurement of the relative position of natural and manmade features on earth's surface and the presentation of this information either graphically or numerically.

Activities

The following are the principal activities of mine surveying:

1. The interpretation of the geology of mineral deposits in relation to the economic exploitation thereof.

2. The investigation and negotiation of mineral mining rights. Making and recording, and calculations of mine surveying measurements.

3. Mining cartography.

4. Investigation and prediction of the effects of mine working on the surface and underground strata.

5. Mine planning in the context of the local environment and subsequent rehabilitation.

Geoinformatics defined

Geo + Information + Matics

Measurement and management of geoinformation.

Geoinformation: ??????

> Any artificial or natural object/phenomena on, below or above the surface of the earth.
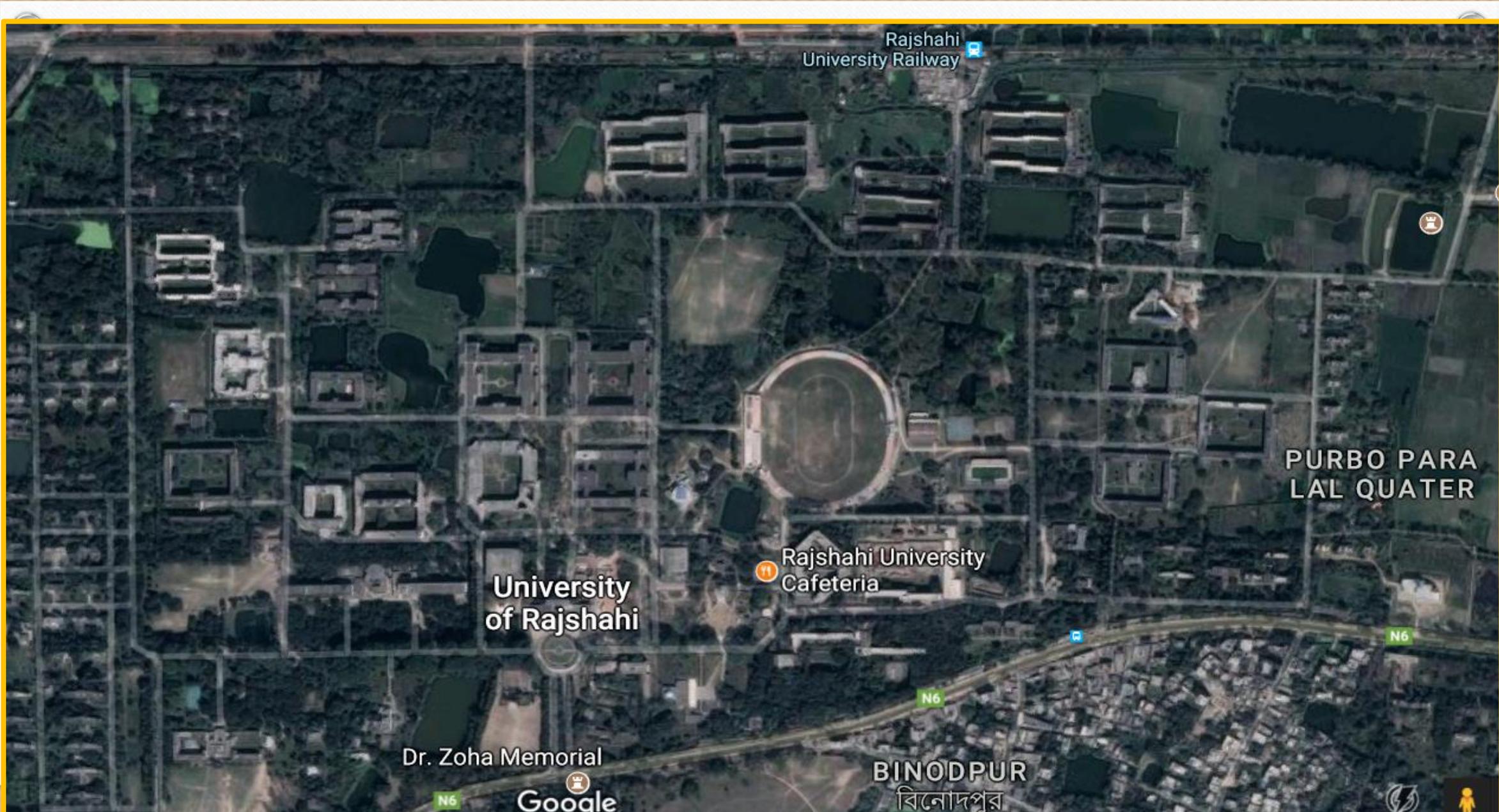
The fundamental divisions of Geoinformatics:

1. Measurement of Geoinformation

    a. Geometry: What is where?

    b. Identification: What is what?

2. Management of Geoinformation

    a. Management (storage, retrieval, presentation) of information

    b. Manipulation (analysis based on information)
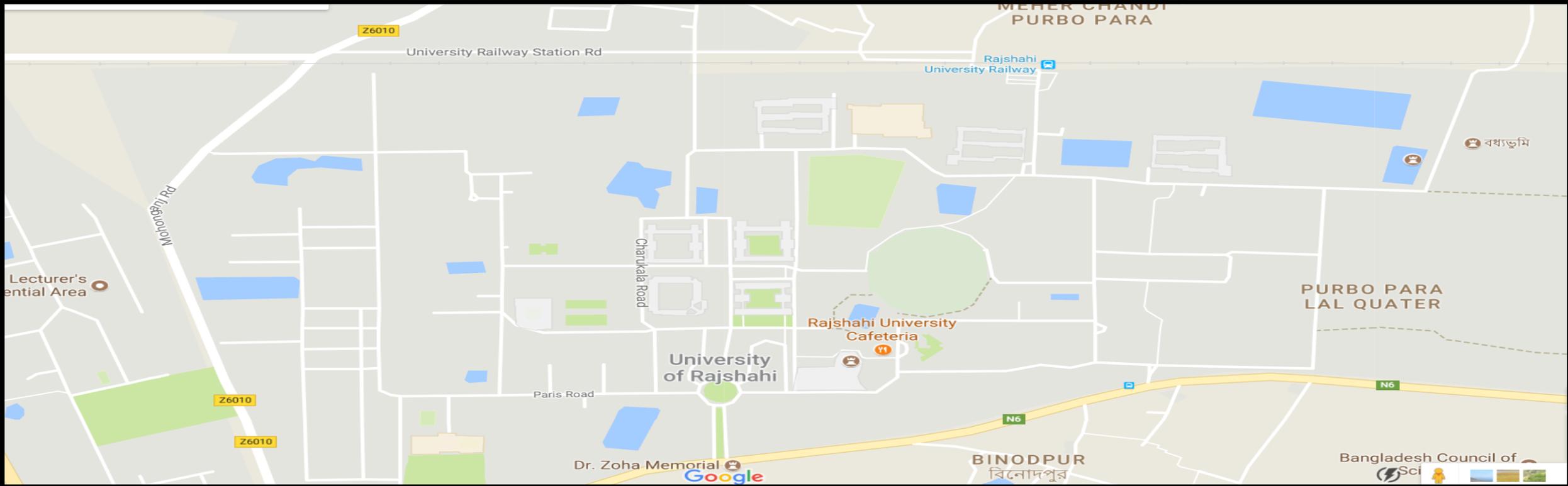
Measurement Geoinformation: Measurement tools
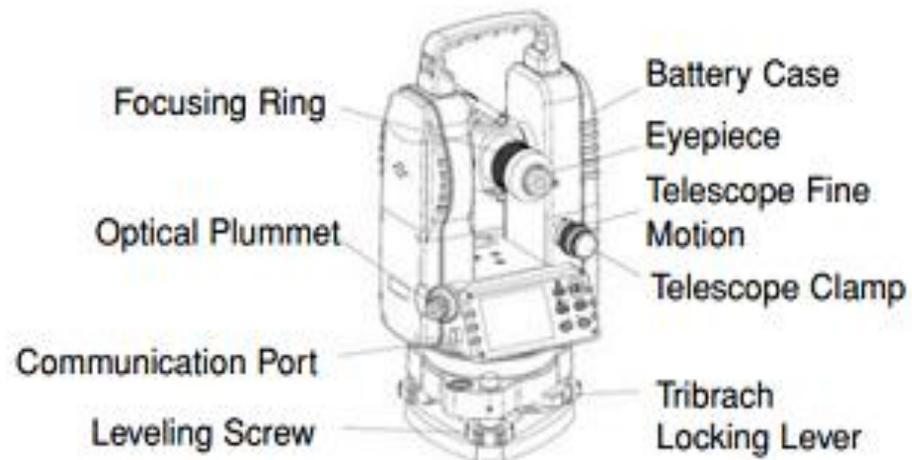
❑ Primitive Techniques:

- ✓ Pacing, hands, guessing, rods.
- ✓ Vedic age method of pacing.
- ✓ Patwari measurement methods.
- ✓ Nali, haath etc.
- ✓ Human figure used mostly.

Land surveying techniques:

- ✓ Using chain and compass
- ✓ Using tape, chain, theodolite etc.
- ❖ But cumbersome and cannot done in inaccessible areas.
- ❖ Substantial human dependence.

Electronic land surveying techniques:

- ✓ Using EDMI (electronic distance measuring instrument) and total station

- ✓ Now robotic total station- Fast, accurate

- ❖ Difficult for inaccessible areas, as points need to be occupied

❑ **Aerial photogrammetry:**

✓ Emerged during world war 1 & 2

✓ Initial uses of pigeon with camera to spy on enemy terrain

✓ Using balloons, aircraft based

✓ Single photograph for interpretation

✓ Stereo for 3D model generation and measurement

❖ Analogue>> Analytical >> Digital photogrammetry

▪ Still we need to fly to collect data every time
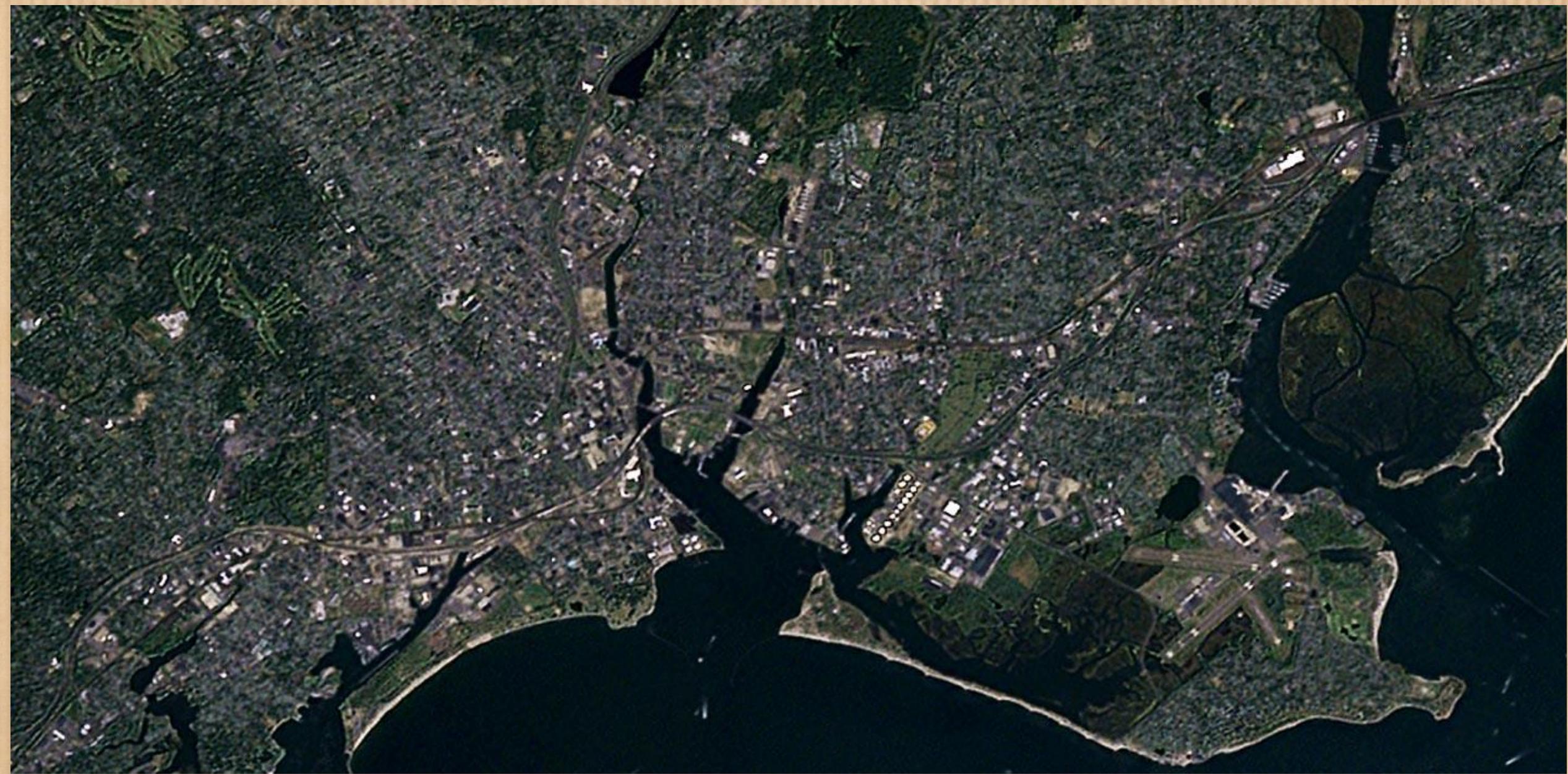
▪ Costly affair and may not be possible in bad weather
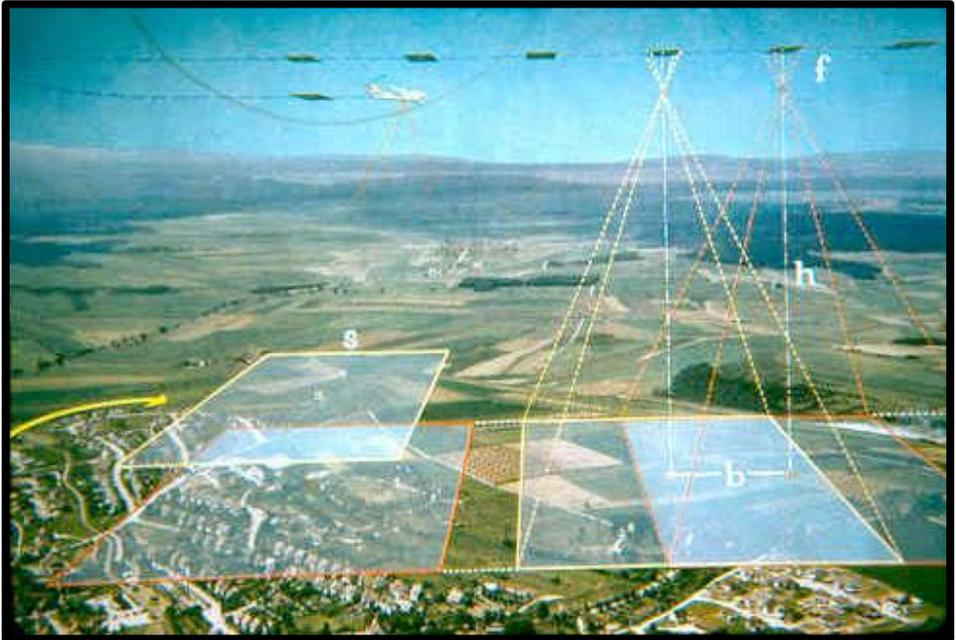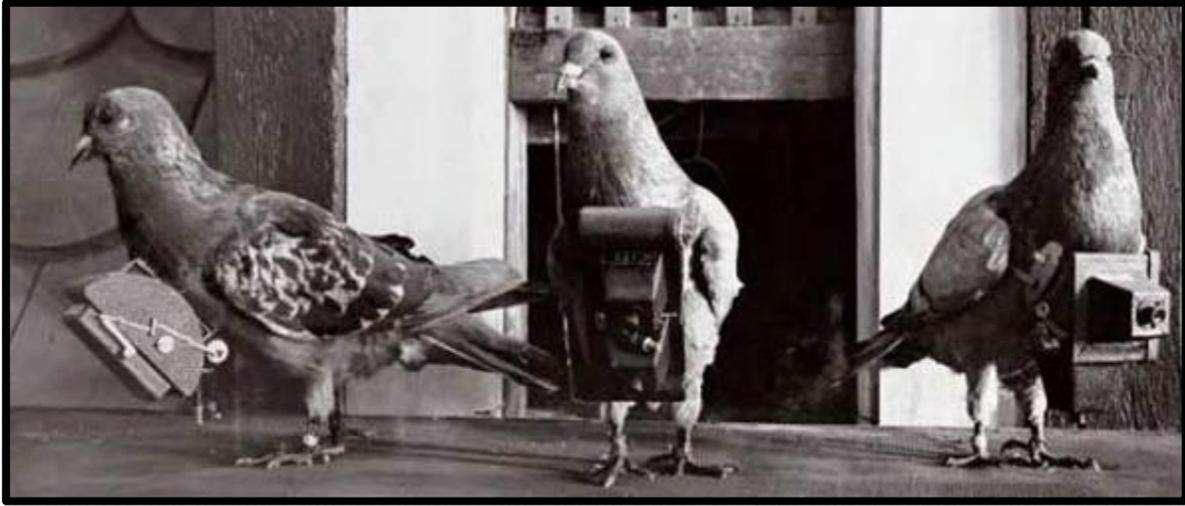
❑ Satellite remote sensing:

✓ Commercial remote sensing since 1972—Landsate (U.S.)

✓ From 600Km to 900Km altitude

✓ To get a synoptic view of terrain regularly in several wave bands

✓ From Km to m level spatial resolution

✓ Used for both Measurement and identification

The Global Satellite Observation System

❑ Global positioning system (GPS):
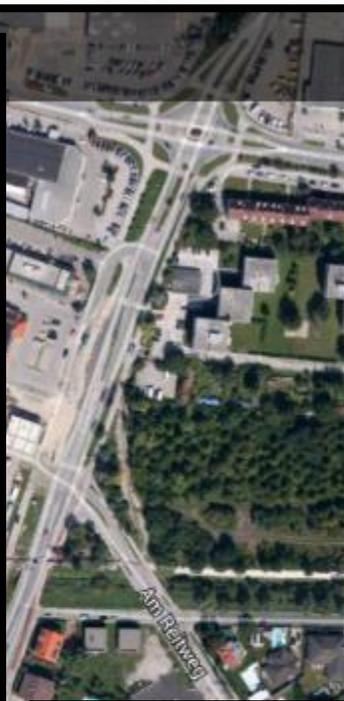
✓ An absolutely new concept to know one's location

✓ Now many orbiting satellites; minimum 4 needed; position known in Geocentric coordinate system

o Fast-Less accurate

o Low-Very accurate

o Can be done everywhere---open sky is seen

o Thousands of applications: more being invented

Management Geoinformation:

- Requirement to **store** and **retrieve** information efficiently.

- Requirement to present information.

- Requirement to **incorporate all information** collected in analysis to suit modern application.

- The Management part i.e. **GIS** (Geographical Information System) does it all!!!

GIS_Geographical Information System

Geographic information system (**GIS**), is a system designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data.

GIS technology continues to play an important role in the study of the earth and all that is on the surface.

We take a look at some of the importance of GIS in geology and how geologists have harnessed the power of this technology to identify solutions. Such as Mapping, Urban Planning, Land Information System, Surveying, Detection of Coal Mine Fires, Worldwide Earthquake Information System, Geological Mapping, Coastal Management, Land Use Changes and Land Administration.

Example of use of GIS

✓ Flood relief operation needs-

➤ Flood extent

➤ Road network and types of roads

➤ Topography of land

➤ Distribution of building (pucca house), one or multi-story houses

➤ Distribution of probable shelters

➤ Locations of rescue team

✓ Flood relief operation-

- A model that uses all above data to locate sites on priority for rescue should be able to make use of all data simultaneously.

- A difficult task for manual interpretation and also using conventional analysis methods.

Outcomes of the lecture

✓ Definition of Survey in general and survey in mine i.e. "Mine Surveying", Geoinformatics, Geoinformation, GIS.

✓ The major activities of surveying relating geological fields.

✓ How Geoinformatics used and its basic ground

✓ Little knowledge on GIS and its uses

Basic Surveying

Thank You