GEOMATICS ENGINEERING DEPARTMENT

FIRST YEAR GEOMATICS

SURVEYING 1 (GED101)

LECTURE NO: 1

COURSE OVERVIEW AND INTRODUCTION

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Assistant Professor of Geomatics

Overview Of Today's Lecture

- Course Overview
- Surveying and Geomatics: An Introduction
- Main Tasks in Geomatics
- Geospatial Technology and Tools
- History and Objectives of Surveying
- Main Principles of Surveying
- Classifications of Surveying
- Applications of Geomatics Engineering
- Online Resources

YOUR SUBJECT

- **Name**: Surveying 1 (Bylaw 2021)
- **Code**: GED101.

- A bridging subject for geomatics students
- Forms a basis for remaining study.
- Promote an awareness of where some geospatial (2D and 3D) data used comes from and the factors that govern its creation and accuracy.
- Class is scheduled every **Wednesday at 11:15 am**.
- Lecture Venue: ***Theatre.***
- Tutorials Venue: ***Sections @ Theatre and A5.***

- ***References***

1. Surveying theory and practice
2. Textbook of surveying

Scope

- Gain a comprehensive understanding of the basic principles of surveying.
- Recognize the different bearing systems used in surveying.
- Identify the applications of surveying.
- Solve the major surveying problems by relating them to mathematical theorems.
- Possess extensive knowledge of the theory of some surveying instruments.
- Accomplish surveying missions using the methodology of field surveying.

CONTENT

1. Surveying Definitions
2. Linear and angular measurements
3. Scales
4. Types of bearings (Bearing systems)
5. Observations and coordinate computations of closed and connected traverses
6. Adjustment of traverses
7. Problem of missing observations
8. Sources of errors
9. Methods of setting out
10. Calculations of areas and volumes
11. Method s of land divisions (parcel divisions)
12. Intersection and resection problems
13. Production of cadastral maps
14. Progress report writing

INTENDED LECTURE SERIES

1) Surveying Definitions (This lecture)
2) Distance Measurements and Tape Surveying
3) Scales
4) Types of bearings (Bearing systems)
5) Observations and coordinate computations of closed and connected traverses
6) Adjustment of traverses
7) Midterm Exam
8) Problem of missing observations
9) Sources of errors & Methods of setting out
10) Calculations of areas and volumes
11) Method s of land divisions (parcel divisions)
12) Intersection and resection problems
13) in surveying observations
14) Progress report writing and production of cadastral maps
15) Final Exam

Expected Learning Outcomes

- **Upon completing this course, students will be able to:**

1. Explain to overcome field problems such as obstacles in tape surveying.
2. Identify the different methods of area calculation.
3. Explain how to correct for errors in observations.
4. Practice professionally surveying management skills.
5. Prepare data field notebook, technical drafts and reports.
6. Use the suitable scale to map an area.
7. Prepare a report on the different kinds of levels and staves used in levelling.
8. Collaborate within groups when applying levelling, tape and compass surveying procedures
9. Use surveying laboratory and field instruments competently and safely.

ASSESSMENT

Surveying 1 (GED101)

Code	Name	Lec.	Tut.	Lab.	Total	Sem. Work	Oral/Lab	Written Exam	Total	Duration of Final Exam
GED101	**Surveying 1**	2	1	3	**6**	45	45	90	180	3 hrs.

Assessment Tool	Week	Weight
Midterm Examination	7	20 %
Final Examination	(As Scheduled)	50 %
Quizzes	3,5,9	10 %
Home assignments, and Reports	2,4,6,8,10,12	10%
Oral Exam	14	10%
Total		100 %

YOUR TEACHER

- **Name: Dr. Eng. Reda Fekry**
  - Lecturer in the Department of Geomatics Engineering
  - Deputy Coordinator of Student Activities for Student Affairs at the College's headquarters in Rod El-Farag
- **Research Interests**
  - Multi-modality 3D remote sensing.
  - Pattern recognition, and related environmental and industrial applications.
  - Sensor fusion for environmental informatics.
  - Deep learning for vision.
  - Object segmentation and classification.
- **Teaching Areas**
  - Surveying and Geodesy.
  - Photogrammetry and Remote Sensing.
  - Geospatial computer vision and machine learning.
- **Room**
  - RCO-30
- **E-mail**
  - reda.abdelkawy@feng.bu.edu.eg
  - fekry.khaliel@connect.polyu.hk

YOUR TUTORS

- **Names**
  - Eng. Abdelhamid Alharty
  - Eng. Mohamed Nashaat
- **Room**
  - RCO-05

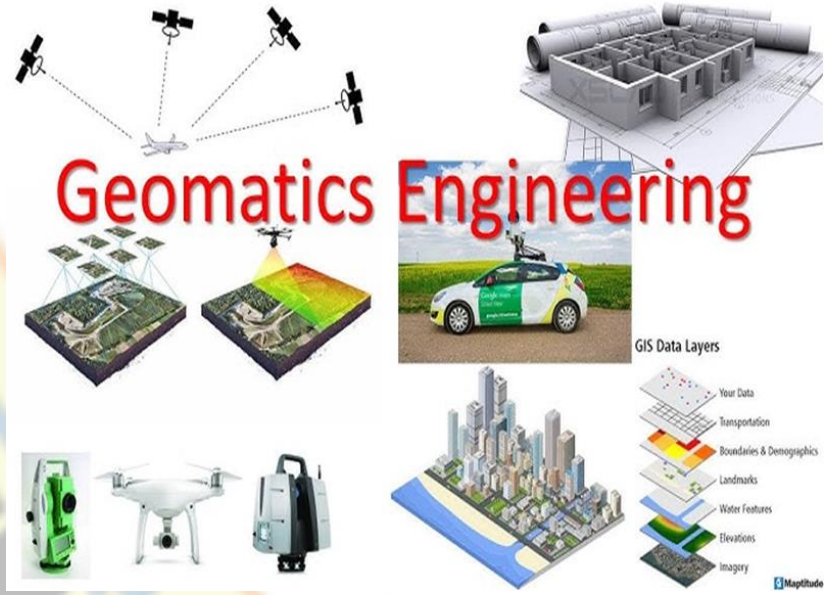
Lecture 1 – Surveying and Geomatics: An Introduction

SURVEYING

- Surveying is the art and science that determines the dimensional relationships between physical features, natural and artificial, on, below, or above the Earth's surface.
- This is done by measuring directions or angles and distance between points.
- Surveying is the first step in the making of plats and maps for location and charts for air and marine navigation

GEOMATICS

- **Geomatics** is that discipline concerned with the collection, collection, distribution, distribution, storage, analysis, processing, presentation of geographic data or geographic information.
- **Geomatics** consists of products, services and tools involved in the collection, integration and management of geographic (geospatial) data.
- **Geomatics** encompasses the fields of geodesy, geographic information systems (GIS), global positioning systems (GPS), hydrography, mapping, photogrammetry, remote sensing, and surveying.
- **Geomatics** engineering professionals use a wide range of technologies, such as acoustic, laser, satellite, and information technologies, for applications related to geography, information systems, law and commerce, land development and planning, and land surveying.
- **Geomatics** engineering incorporates aspects of Computer Engineering, Software Engineering, and Civil Engineering.



GEOMATICS ENGINEERING EMPLOYS:

Location and navigation systems	Virtual reality	Geodesy and surveying
Intelligent and autonomous systems	Remote sensing of the environments	Satellite and unmanned aerial systems
Geospatial information systems	Integration of detection-and-localization sensors	Mobile mapping
Smart infrastructure	Artificial intelligence for geospatial solutions	.....

Geomatics is *broader than* Surveying

Four Main Tasks in Geomatics

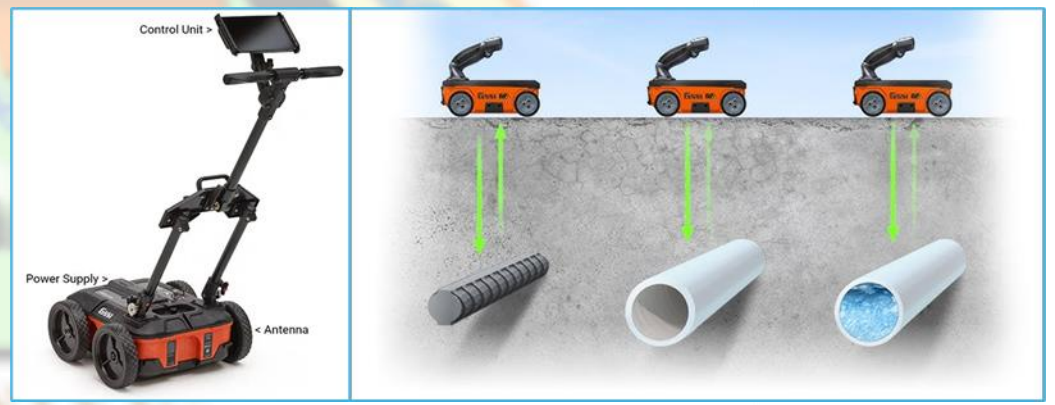
1. Collection and processing of geodata.
2. Development and management of geodatabases.
3. Analysis and modeling of geodata.
4. Development and integration of geodata based on software.

GEOSPATIAL TECHNOLOGY

- **GIS/Spatial Analytics**
  - Desktop
  - Web/Cloud
  - Mobile
- **GNSS and Positioning**
  - Navigation
  - Indoor localization
  - Surveying
- **Earth observation**
  - Satellite remote sensing
  - Aerial mapping
  - UAVs/Drones
- **Scanning**
  - LiDAR
  - Laser scanning
  - Radar

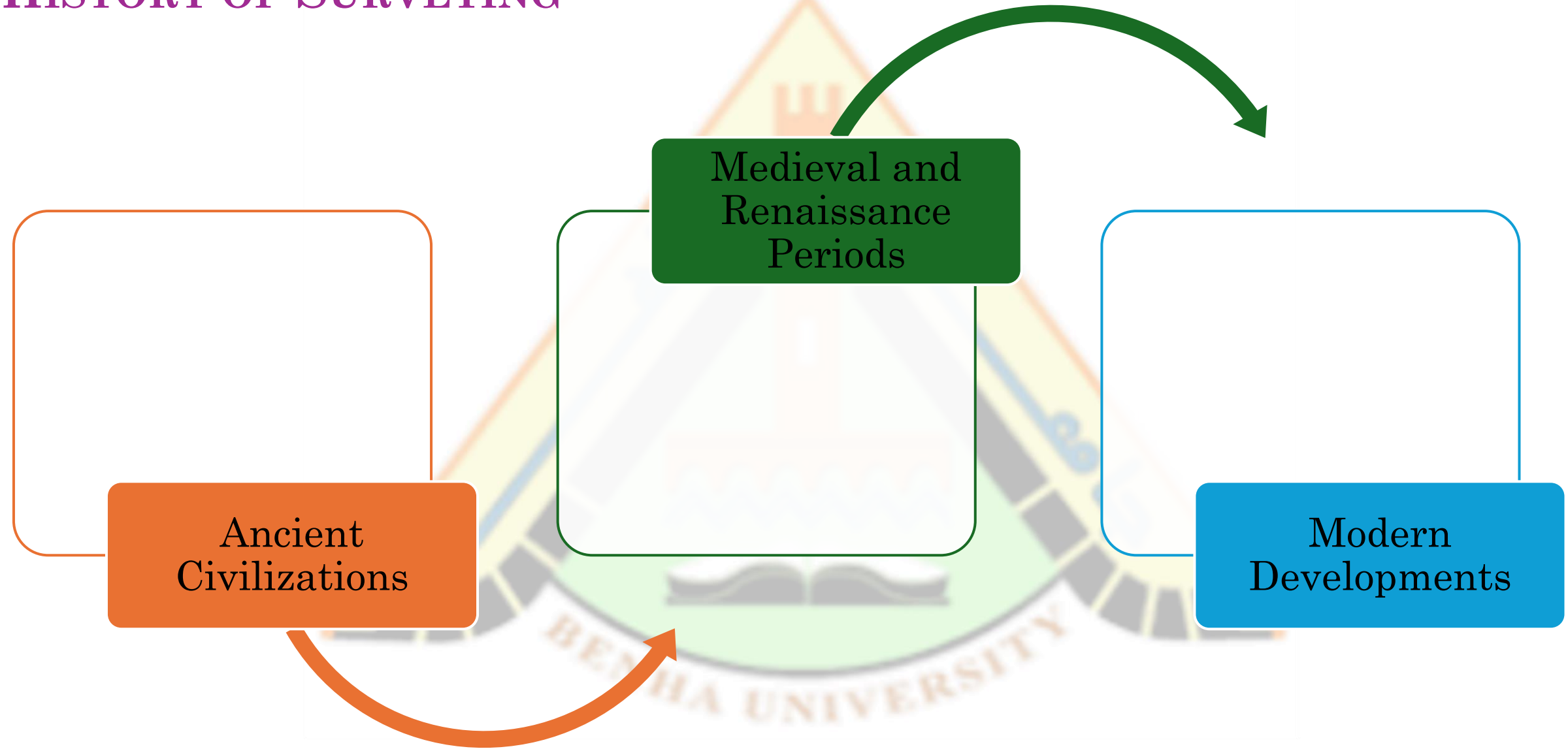
GEOSPATIAL TOOLS

- Field data
- Global Navigation Satellite System (GNSS)
- Geodesy
- Ground Penetrating Radar (GPR)
- Cartography and map projection
- Photogrammetry and remote sensing
- Web-mapping
- Computer Science
- Computer vision
- Mobile and game technology
- Internet of things



Images from Internet

History of Surveying



History of Surveying - Ancient Civilizations

Ancient Egyptians (c. 2700 BCE)

1. They established boundaries and measure land for agricultural purposes using simple surveying tools.
2. They also used surveying for the construction of monumental structures like pyramids and temples.
3. The Great Pyramid of Khufu at Giza was built about 2700 BCE, 755 feet (230 metres) long and 481 feet (147 metres) high. Its nearly perfect squareness and north–south orientation affirm the ancient Egyptians' command of surveying.

Ancient Greeks (c. 600 BCE)

1. Mathematicians such as Thales, Pythagoras, and Euclid developed geometric principles and methods that were applied to surveying.

Roman Empire (c. 1st century BCE - 5th century CE)

1. The Romans were known for their advanced engineering and infrastructure projects.
2. They used surveying extensively to plan and construct roads, aqueducts, and buildings.
3. The Roman surveying system, known as the "Groma," involved the use of a basic surveying instrument to establish straight lines and right angles

History of Surveying - Medieval and Renaissance Periods

Islamic Golden Age (8th-14th centuries)

1. During this period, Islamic scholars made significant advancements in mathematics and astronomy.
2. These advancements influenced surveying techniques, particularly in the areas of geodesy (the study of Earth's shape and size) and celestial navigation.

Age of Exploration (15th-17th centuries)

1. The European Age of Exploration led to increased demand for accurate maps and charts.
2. Explorers such as Christopher Columbus and Ferdinand Magellan relied on surveying techniques to navigate and map the newly discovered lands.

History of Surveying - Modern Developments

18th and 19th centuries

1. The development of more accurate surveying instruments, such as the theodolite, enabled greater precision in measuring angles and distances.
2. This period also saw advancements in geodetic surveying, with the determination of the Earth's shape and the establishment of geodetic reference systems.

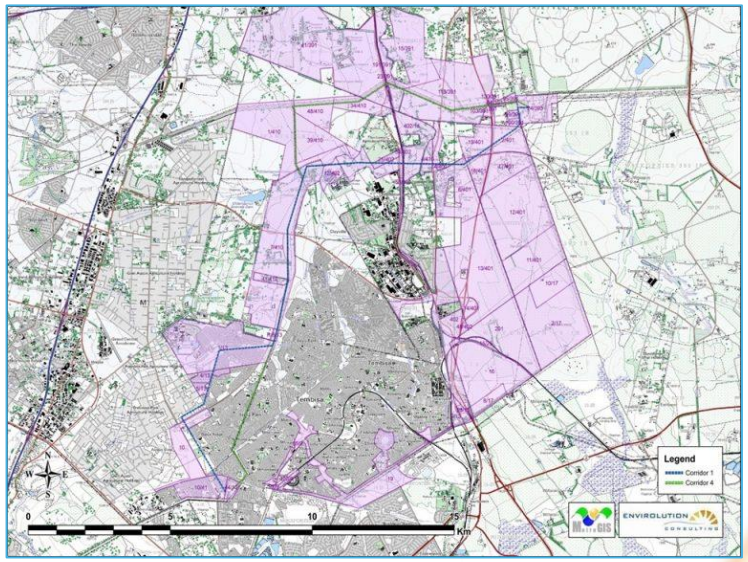
20th century

1. The invention of electronic distance measurement (EDM) devices and the total station revolutionized surveying.
2. These tools allowed for faster and more precise measurements, leading to increased efficiency in land surveying, construction, and mapping.

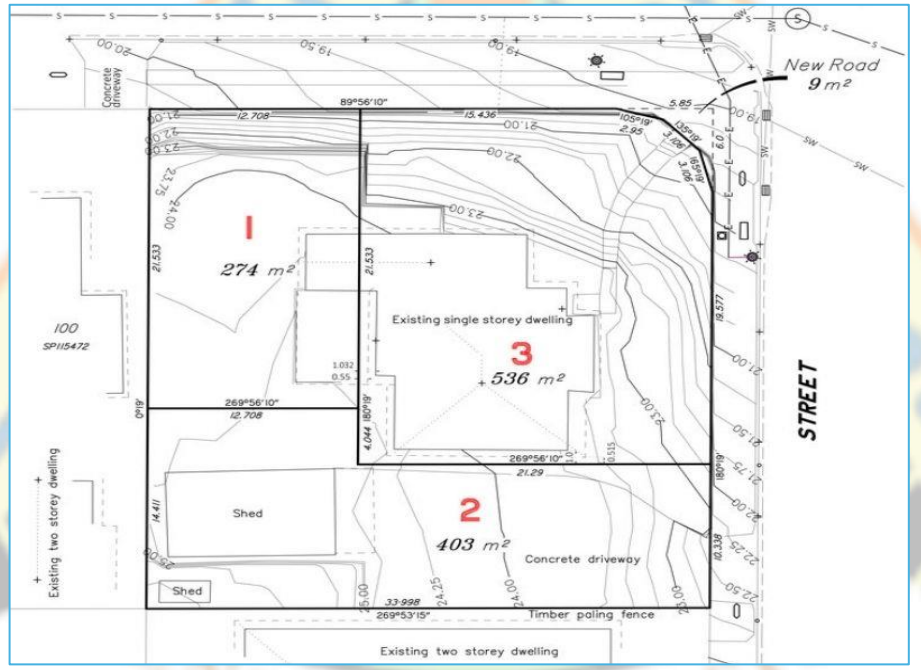
Present days

1. Surveying science has continued to evolve with the advent of global navigation satellite systems (GNSS), such as GPS (Global Positioning System).
2. GNSS technology enables highly accurate positioning and mapping on a global scale.
3. LiDAR
4. Drones

OBJECTIVES OF SURVEYING



(1) Preparing a map to show the relative position of the objects on/below the earth's surface

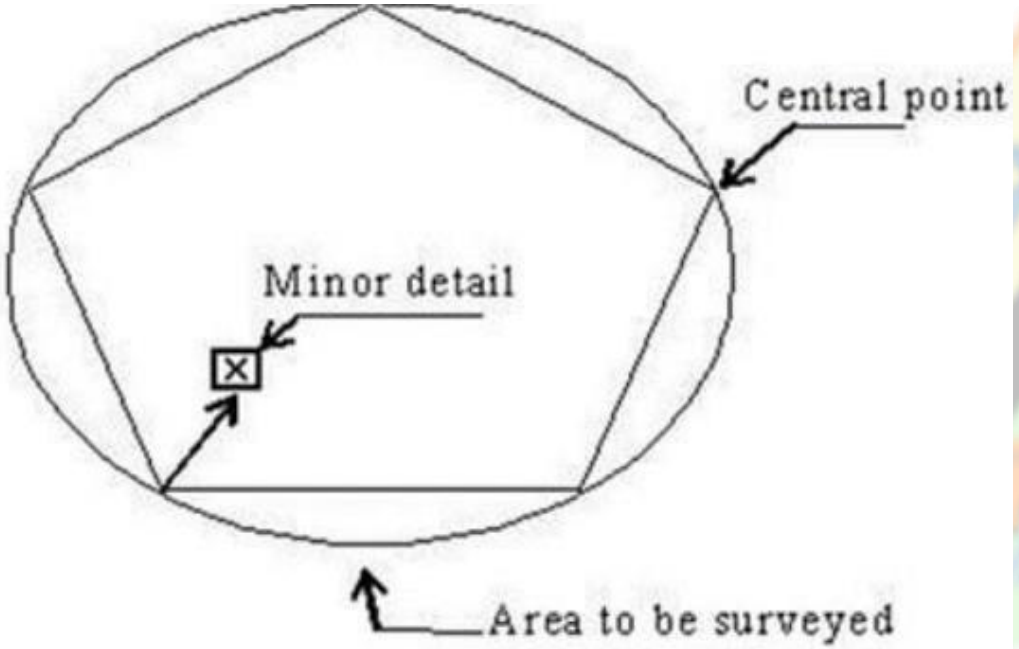


(2) Establishing the boundaries of the land

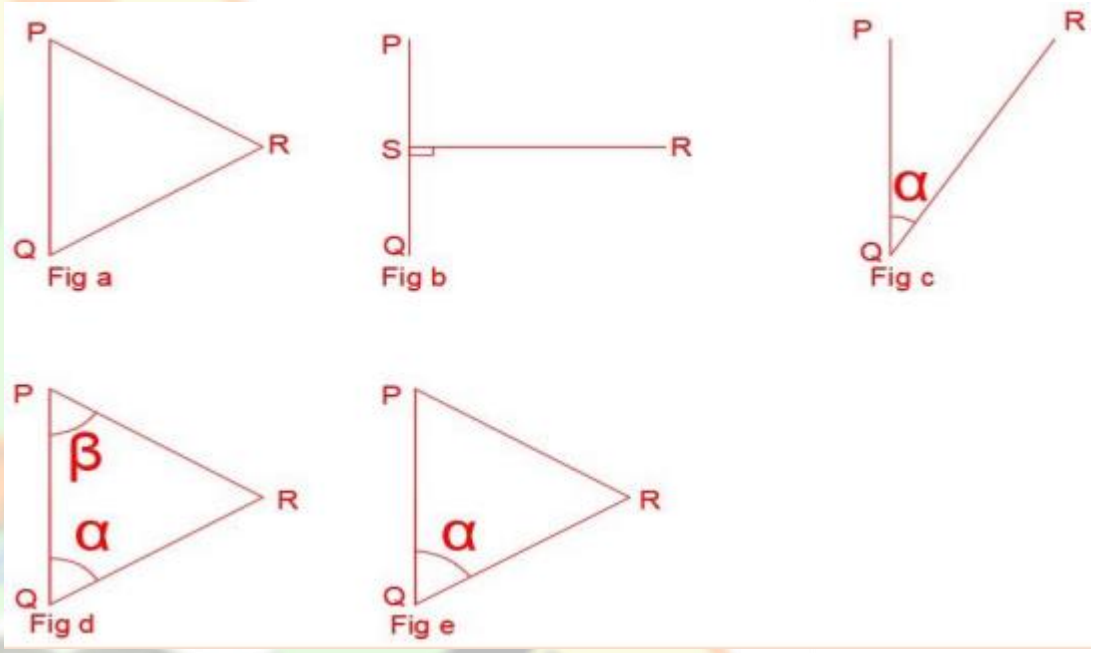
(3) Selecting suitable sites for engineering projects

Main Principles Of Surveying

1. Working from whole to the part.



2. Locating a point by at least two measurements.



TYPES/CLASSIFICATIONS OF SURVEYING

Types of Surveying

By Place of Surveying
- Land
- Airborne
- Hydrographic

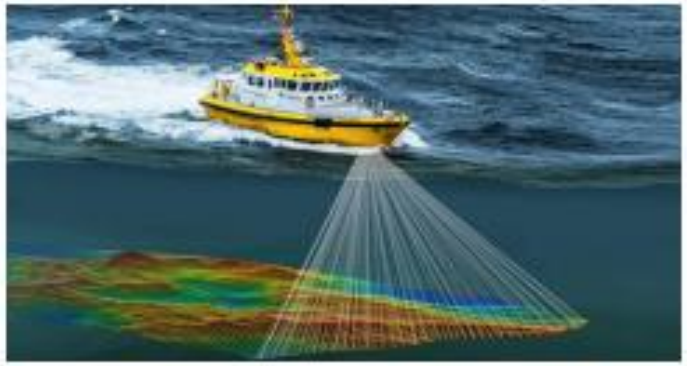
By Coverage of Surveying
- Plane
- Geodetic

By Instrument
- GPS
- Drone
- .....

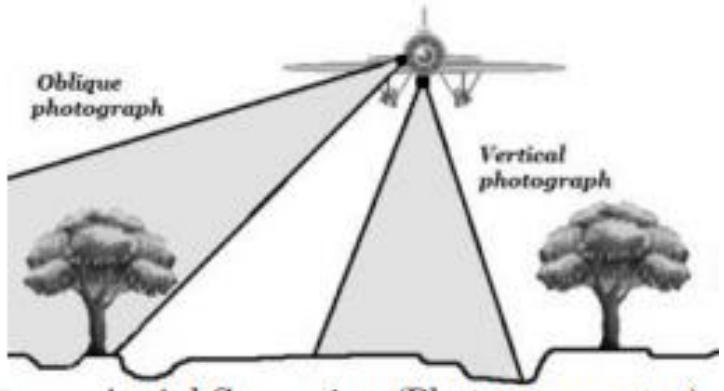
By Methods of Surveying
- Triangulation
- Trilateration

By Purpose of Surveying
- Topographic
- Control
- Route
- Mining
- ...

Types of Surveying – (1) By Place of Surveying



Hydrographic Surveying



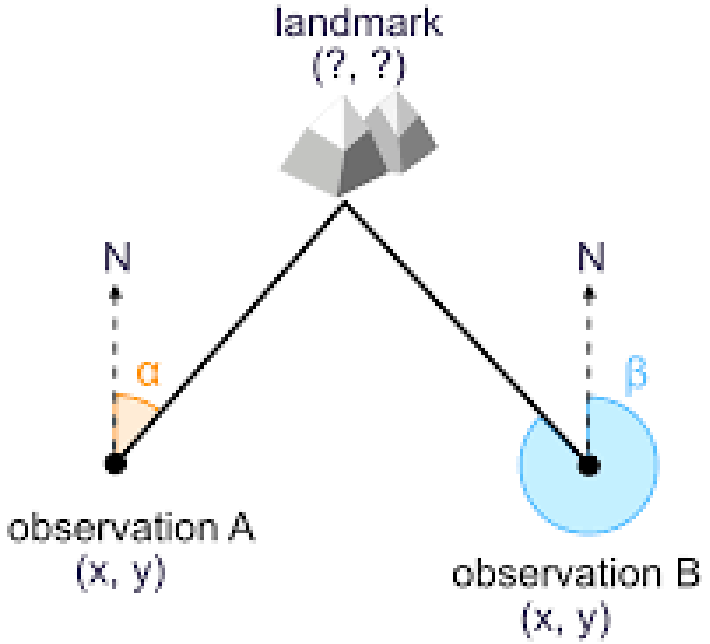
Aerial Surveying (Photogrammetry)

Land Surveying

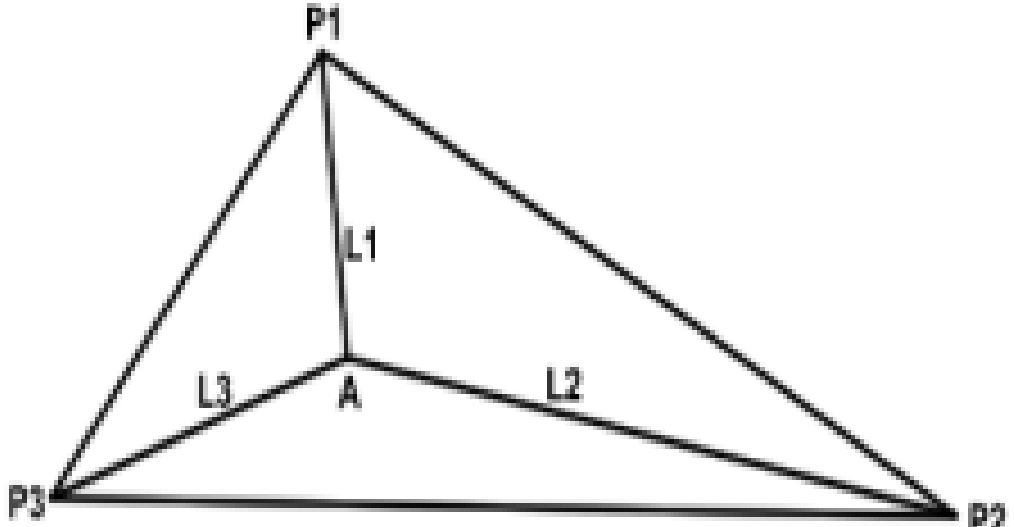
Images from Internet

Types of Surveying – (2) By Methods of Surveying

- **Triangulation Surveying**: All *angles* are measured.
- **Trilateration Surveying**: All *lengths* are measured.



Triangulation

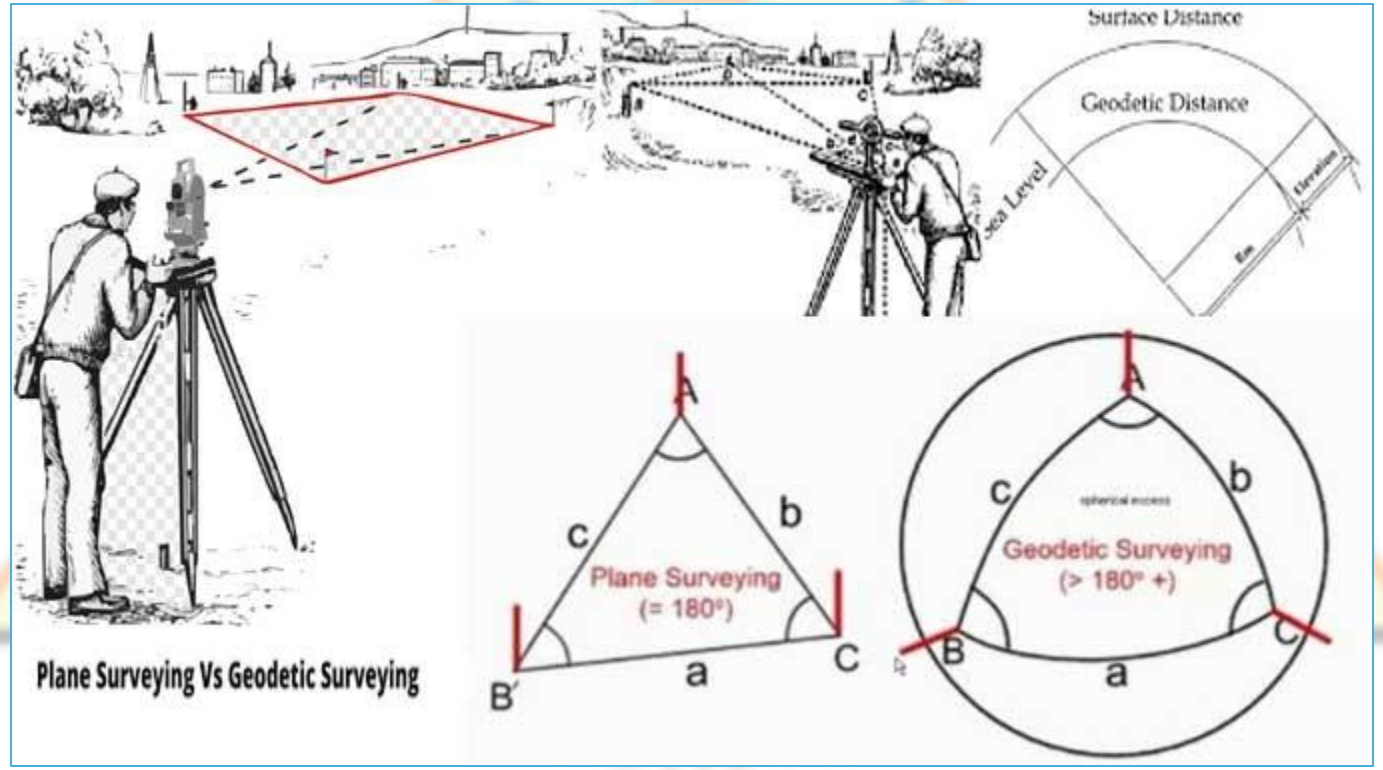


Trilateration

Images from Internet

Types of Surveying – (3) By Coverage of Surveying

- **Plane Surveying**: Earth is flat.
- **Geodetic Surveying**: Earth's curvature is considered.



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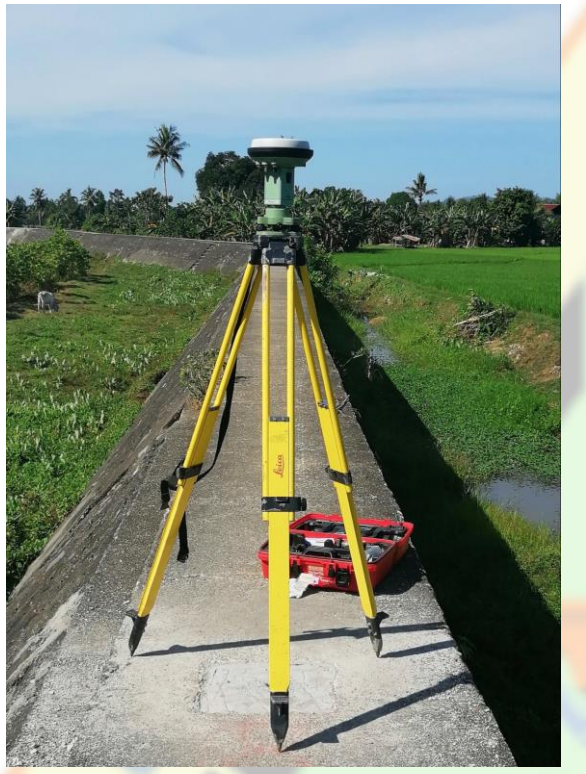
Types of Surveying – (4) By Purpose of Surveying

Mining Surveying



Control Surveying

Engineering Surveying

Route Surveying

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TYPES OF SURVEYING – (5) BY USED INSTRUMENT

rveying

GNSS Surveying

Laser scanning Surveying

Drone Surveying

Theodolite Surveying

Total Station Surveying

Compass Surveying

Tacheometry Surveying

Eco sounder Surveying

Images from Internet

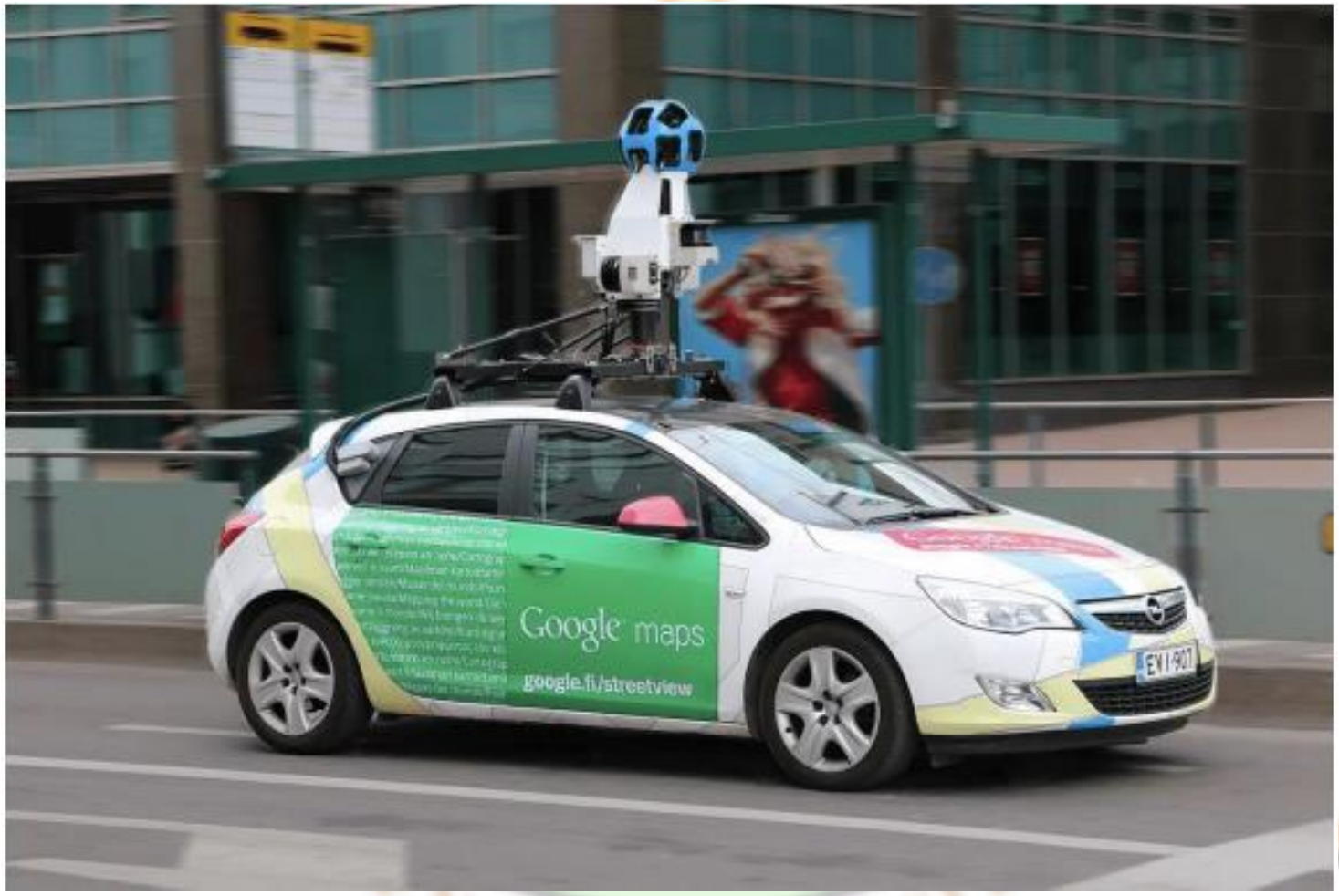
WHY TO STUDY GEOMATICS ENGINEERING?

APPLICATIONS OF GEOMATICS ENGINEERING

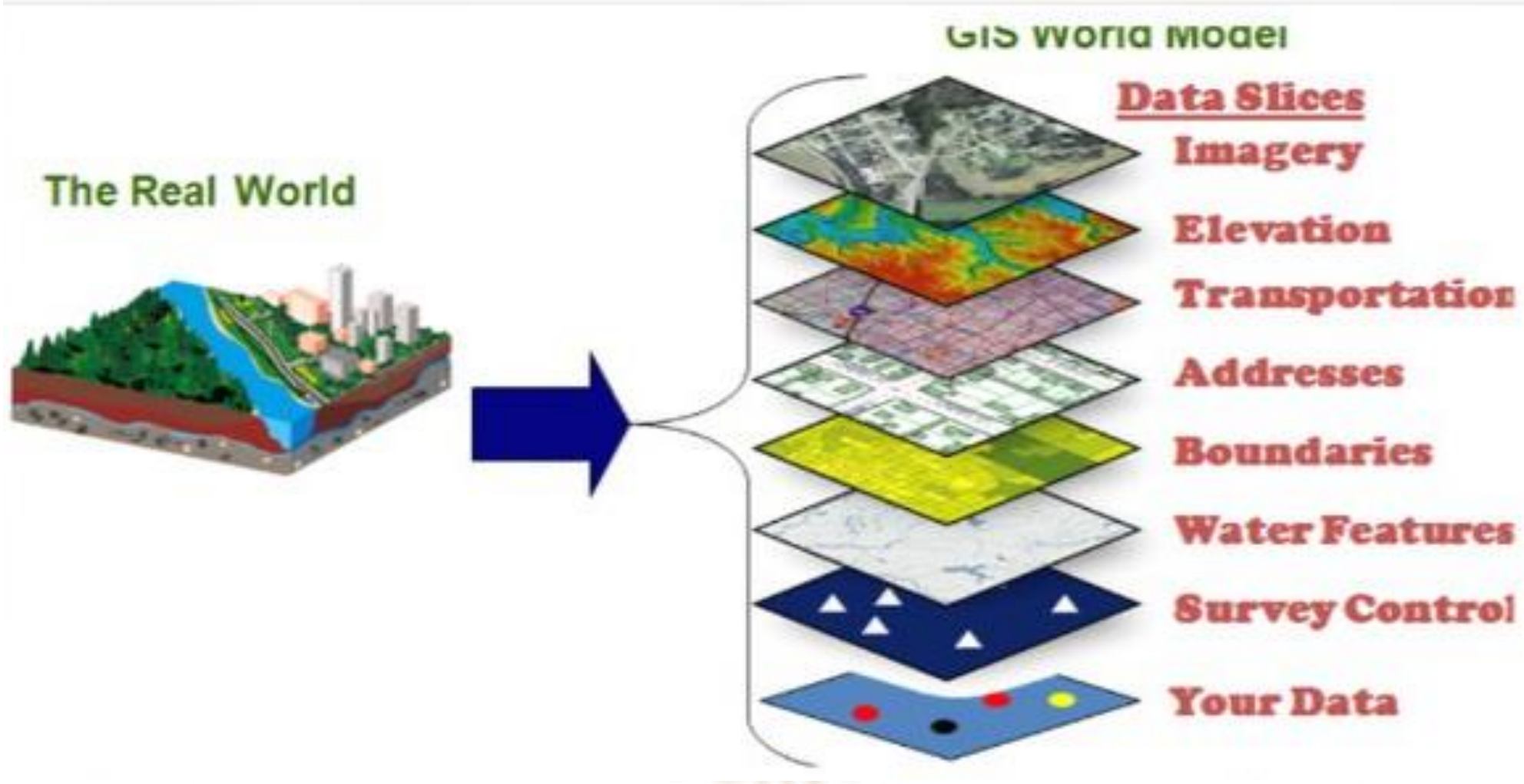
APPLICATIONS OF GEOMATICS ENGINEERING

Emergency Services	Public health	Traffic & transportation	Meteorology	Climate change	Oceanography
Infrastructure	Mineral and oil exploration	Urban planning	Atmospheric modeling	Business	Crime mapping
Land use	Watershed management	Environmental modelling	Location-based planning	Telecommunications	Navigation systems
	Agriculture		Military	etc……..	

APPLICATIONS OF GEOMATICS ENGINEERING



Applications of Geomatics Engineering



Online Resources

- Egyptian General Survey Authority: https://www.esa.gov.eg/
- International Federation of surveyors: https://www.fig.net/

End Of Presentation

Thank You For Attention!