

Introduction to GPS

Teacher: Dr. Atta-ur-Rahman Course: Geographic Information System Lecture 5

Introduction

- Satellite-based Radio Navigation System designed to provide accurate positioning information
- Originally GPS was developed as a defense system by US Department of Defense to simplify accurate navigation
- Civilian use of this satellite system was authorized and widely used worldwide

What is a NAVSTAR GPS?

- Stands for Navigational Satellite Timing and Ranging Global Positioning System
- **3-Dimensional measurement system based on satellite system**
- GPS uses satellites, receivers and computers to locate positions anywhere on the Earth
- Full Operational Capability in July 1995
- All weather operation from Land, Sea, and Air

- Location : To determine a basic position
- Navigation: Getting from one location to another
- Tracking: Monitoring the movement of people and things
- Mapping: Creating maps of the world
- Timing: Bringing precise timing to the world

Three Segments of GPS

- **Space segment** consisting of satellites which broadcast signals
- Control segment steering the whole system
- User segment including many types of receivers

Components of GPS



USER SEGMENT

Track Code and Phase

Computes Position

•Extract Satellite Message



SPACE SEGMENT •24 Satellites •12 Hour Orbital Period •10,900 N.miles Altitude

CONTROL SEGMENT

Time Synchronization
Orbit Prediction
Satellite Health



- 24 Block II Production Satellites
- 6 Orbital Planes, 4 Satellites on each orbit in equally spaced
- 55 Degree Inclination to Equatorial Plane
- 20,200 Km (10,900 N. miles) Altitude
- 24 Hour Coverage 3-D Worldwide
- 12-hour Orbital period
- Velocity of satellites is approx.. 4 km/sec
- 5-8 Visible Satellites from any point



Control Segment

- One master control station
- Five monitoring stations
- Three ground antennas
- Satellites health maintained and monitored
- Satellite orbits were determined and checked
- Clocks behavior are monitored and calculated
- Inject broadcast message



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Global Positioning System (GPS) Master Control and Monitor Station Network