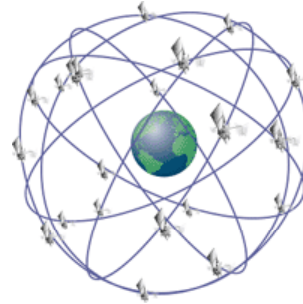
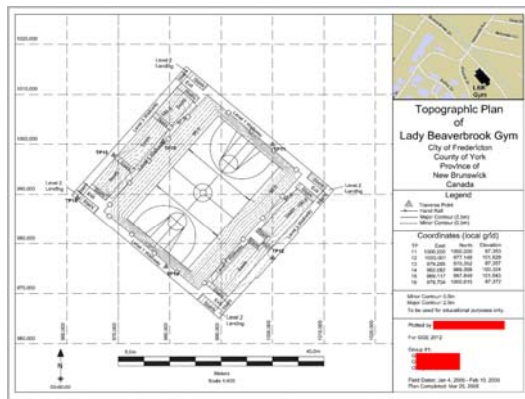


## DEM(cont')

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## DEM (Digital Elevation Model)

- ◆ Old method for DTM creation
  - Total Station and Differential Levels
    - : No foliage issue, Weather dependent
    - : Time-Consuming
    - : Most accurate (one centimeter deviation from DTM)
  - Photogrammetric Data Collection
    - : Aerial photos relatively low altitude
    - : Limited on heavy foliage environment
    - : Accuracy (six cm ~ three cm from DTM)
  - GPS RTK (real-time kinematics)
    - : Receiver mounted on a rod or a vehicle
    - : foliage or overhead obstruction affect the observation
    - : Accuracy (up to one cm without any obstruction)
    - : Relative way, or Absolute way (less precise)

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## DEM (Digital Elevation Model)

### ◆ New method for DTM creation

- Combined GPS RTK  
(GPS RTK, with Gyroscope, with Sensor bar)
    1. GPS receiver mounted on a vehicle interacting with other remote reference stations (relative way)
    2. Highly accurate gyroscope that recognize its direction and location
    3. Sensor bar that contains several remote sensing logging receivers
    4. Integration of all data recorded
- : fastest way, and accurate  
: accuracy is around two centimeters

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## DEM (Digital Elevation Model)

### ◆ Next generation of DTM

- DTM
  - : TIN (triangulated irregular network) - based on Delaunay Triangulation
  - : TTN (triangulated topological network) - randomized triangles, for military usage.
- TTN
  - : Consider that various point and linear types could exist within a model that should have differing influences on the way the triangle legs are formed.
  - : Random - point with no specific control to consider in triangulation
  - : more intelligent way of making DTM (included underground and overhead utilities, drainage structure and standard construction pay items, or easement.

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## DEM (Digital Elevation Model)

### ◆ Pro's, Con's of the different method

Total Station	Lower startup cost, many trained personnel available, learning curve is quite small due to several available people in the market	Safety, traffic, inclement weather
Total Station with GPS	Median startup cost, easier to bring in control points, easier to collect data when in open areas using kinematic mode, very accurate data due to ability to bring in control easily	Safety, traffic, inclement weather, canopy, lack of localized control
Photogrammetry	Mid Range startup cost, as long as most of the work is sublet to other consultants for flights, control surveys, and bundle adjustments. Open areas can be flown in minimal time, versus field surveying. Best advantage for this method is derived when collecting data from models that do not require high accuracy, as are used in general mapping and planning.	Canopy, lack of localized control, seasons, inclement weather, availability of planes or helicopters
Combined Approach	This system is extremely fast and accurate. Unlike GPS, canopy is not a problem. In order to be cost effective, many jobs would need to be done to recoup initial startup cost. Once initial investment had been met this system will far exceed any other method for collecting data along a drivable corridor.	Lack of localized control

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## DEM (Digital Elevation Model)

### ◆ An example (Combined way)



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## References

- ◆ Digital terrain model creation from vehicle mounted RTK GPS, gyroscope, and mounted sensors:  
(American Congress on Surveying and Mapping)

<http://www.acsm.net/sessions.html>

<http://www.acsm.net/sessions03/VendorSolutions42b.pdf>