Navigation

Navigation is one of the primary tasks of GPS. In aviation and sea travel, finding proper travel direction has required special training and various navigation aids have been used. Availability of GPS not only eased the role of a navigator, but also expanded the range of applications where principles of navigation have been implemented (e.g., transportation, agriculture, etc.).

Explorer's Guide

Before You Start

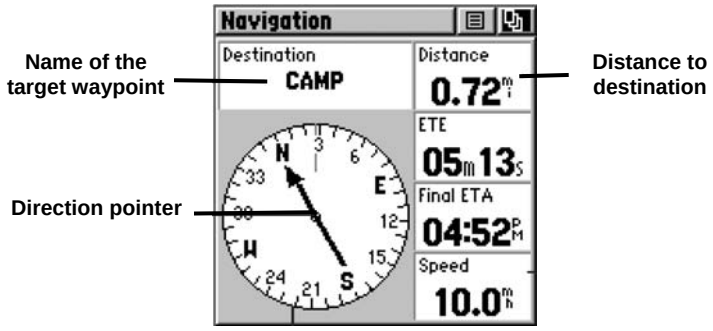
Using a map of the exercise area and a compass, navigate along a predefined route. Thus, use the compass to orient the map and use the map to estimate distance to the next waypoint. What principles do you use? How well can you maintain proper travel direction? How do you know your whereabouts at all times?

Learning by Doing

1. Numbered 1 through 4, enter four different waypoints from the exercise area into a GPS receiver (Activity 9). Use this receiver to navigate from one point to the next while visiting waypoints in the order prescribed.

2. IF using a Garmin Rino receiver, select **Find 'N Go** feature from the **Main Menu** (see figure below). Using any scroll listing of waypoints, select the name of the waypoint you want to navigate and press **Go To**..

3. To navigate, hold the receiver horizontally while looking straight at the screen and follow the arrow (see figure below). From time to time, switch to the **Map** page to see your actual position change with respect to other objects visible on the base map.



4. When the distance to the target is less that 3 m (10 ft) and arrow becomes unstable, stop and try to locate the waypoint. Measure how many steps are left to reach the waypoint and record your observations in the table below.

Point	Name	Description	Number of Steps

How Does It Work

When performing navigation, it is important to know your location all the time, determine and constantly update direction and distance to the target location. Conventionally, this can be done using a compass and a map. However, once you do not have an object clearly marked on the map in sight, your relative position to other objects becomes questionable.

When current location is known, you can use compass to align its arrow (always pointing toward the Magnetic North) with the North Arrow shown on the map. Then, determine proper travel direction and measure the distance to the target using the scale bar shown on the map. While moving to the target, make sure the direction is maintained and use other geographic objects on the map to assure proper route of travel. It is also important to remember that magnetic north is not the same as the true north, and many maps (e.g., aviation charts) contain elements helping users making necessary corrections.

With a GPS receiver, navigation is done using **Navigation** page that is actually a virtual compass. The GPS receiver knows your location at any given time and knows the location of a waypoint you are going to. Therefore, at every instance, it recalculates remaining distance (Activity 8) and travel direction. Some receivers have built-in electronic compass that assures proper operation even when you are not moving. Hover, to function properly, most GPS receivers must be moved. Therefore, before starting toward the next waypoint, moving back and forth to stimulate GPS receiver obtains the most accurate estimates.

Additional Challenge

Use a GPS receiver to navigate to school, home, or a movie theater. How do you deal with obstacles? How many minimum waypoints it would take to make one of these trips using only designated roads and pathways?

Vocabulary

Navigation *is the process of planning, recording, and controlling the movement of a craft or vehicle from one place to another.*
Magnetic North *(also called compass north) is the direction from a point on the earth's surface following a great circle toward the magnetic north pole, indicated by the north-seeking end of a compass.*
True North *(also called geographic north) is the direction from any point on the earth's surface to the north geographic pole.*

Interesting to Know

Many animals, such as whales, dolphins, tuna, salmon, honeybees, pigeons, and sea turtles have the ability to navigate themselves through the magnetic field of the earth. They possess magnetite crystals in contact with neurons in their brains, which sense the inclination and the intensity of the magnetic field. Since these magnetic parameters vary with latitude and longitude, the animals can sense their geographic position.

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