presentation about Radar signal

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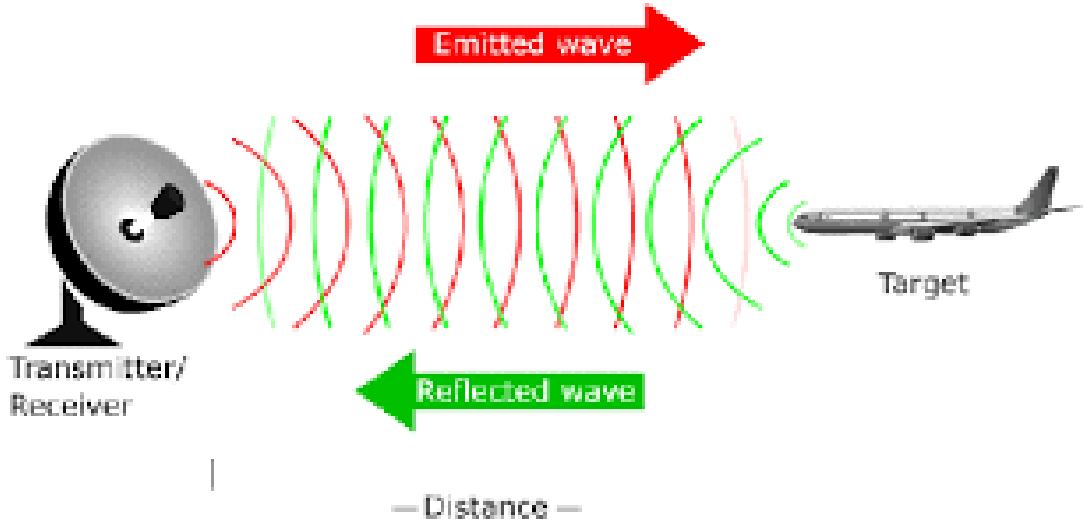
Introducing Radar

Radar is an electromagnetic sensor used to track, locate, and identify various objects from long distances. Radar may be able to determine the size and shape of these objects as well. Its working principle depends on transmitting electromagnetic energy towards specific targets, and monitoring the echoes returning from them. These may be The targets are planes, ships, spacecraft, cars, or even birds. Radar devices are distinguished from optical sensors and infrared devices in their ability to accurately detect distant objects even in the presence of difficult weather conditions. Doppler radar is a radar that specializes in determining the speed of objects, and its working principle is based on the knowledge that the waves produced by the body will gather when the individual or device approaches it, and will spread when it moves away from it, such as the radar used to monitor the speed of cars.

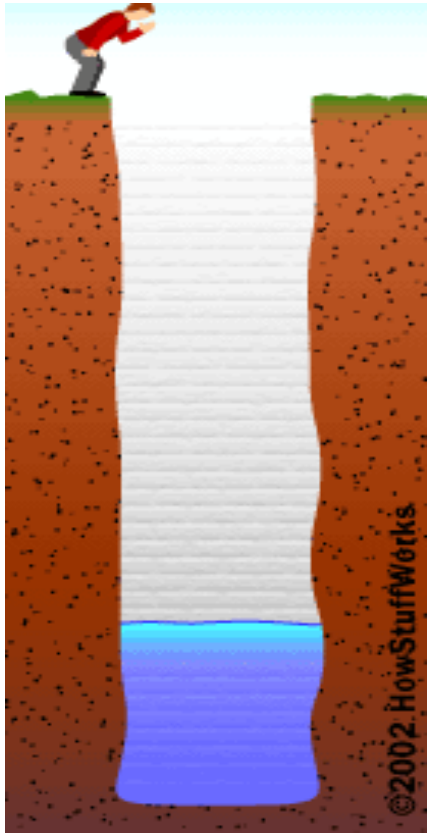


Types of radar devices

There are several types of radar devices that differ according to their use, including the following: Marine radar devices are used to determine the direction of ships and the distance between them to avoid collisions, and to determine their locations at sea based on fixed references such as islands. Aerial radar devices, aircraft are equipped with radar devices, in order to avoid obstructing their path, and to accurately determine air altitude readings. Radar devices in missile guidance systems, used in military aircraft to determine missile destinations. Radar devices in biological research, such as those used to track the migration patterns of animals and birds. Weather radars are used to increase the accuracy of forecasting the weather.

1)ECHO

Echo is a phenomenon you experience every day. If you shout in a well or narrow valley, you will hear the echo after a few moments. The echo occurs because your sound waves will reflect off the opposite surface (even if the surface of the water is below the well or on the other side of the valley) and bounce directly back to your ears, and the time between the moment you utter the cry and the moment you hear the echo depends on the distance between you and the surface on which the sound wave was reflected causing echo.



2) audible sound

We've seen how we can use echoes to determine how far an object is from us, and how we can use the Doppler shift to determine how fast an object is moving. Now we can make sound radar, and this is the principle of sonar. Submarines and ships always use sonar. You can use the same audio features in the air, but this will cause several problems:

- Sound does not travel very far, maybe 1 mile (1.6 km) at most.
- Since anyone can hear the sounds, the sonic radar will inevitably disturb the neighbors (this problem can be overcome by using ultrasonic waves instead of audible sound waves).
- The poor efficiency of the echo of sound waves will make it difficult to monitor it

That is why radar uses radio waves, not sound waves. Radio waves are very fast, invisible to humans, and easy to detect, even if they are weak.

Let's now study a typical radar designed specifically to monitor aircraft in flight. This radar operates its transmitter to emit a short, high-intensity string of radio waves, lasting only microseconds, then the radar turns off the transmitter, turns on the receiver, which records the echo of the emitted waves, and measures the time it took for the echo and its Doppler shift

Left: Antennas at the Deep Space Communications Complex, part of NASA's Deep Space Network that helps secure radio communications with spacecraft, Right: A surface-scanning radio and an antenna-scanning radio on a guided-missile destroyer

Results

1) The hardware model of the project is shown in Figure 8.

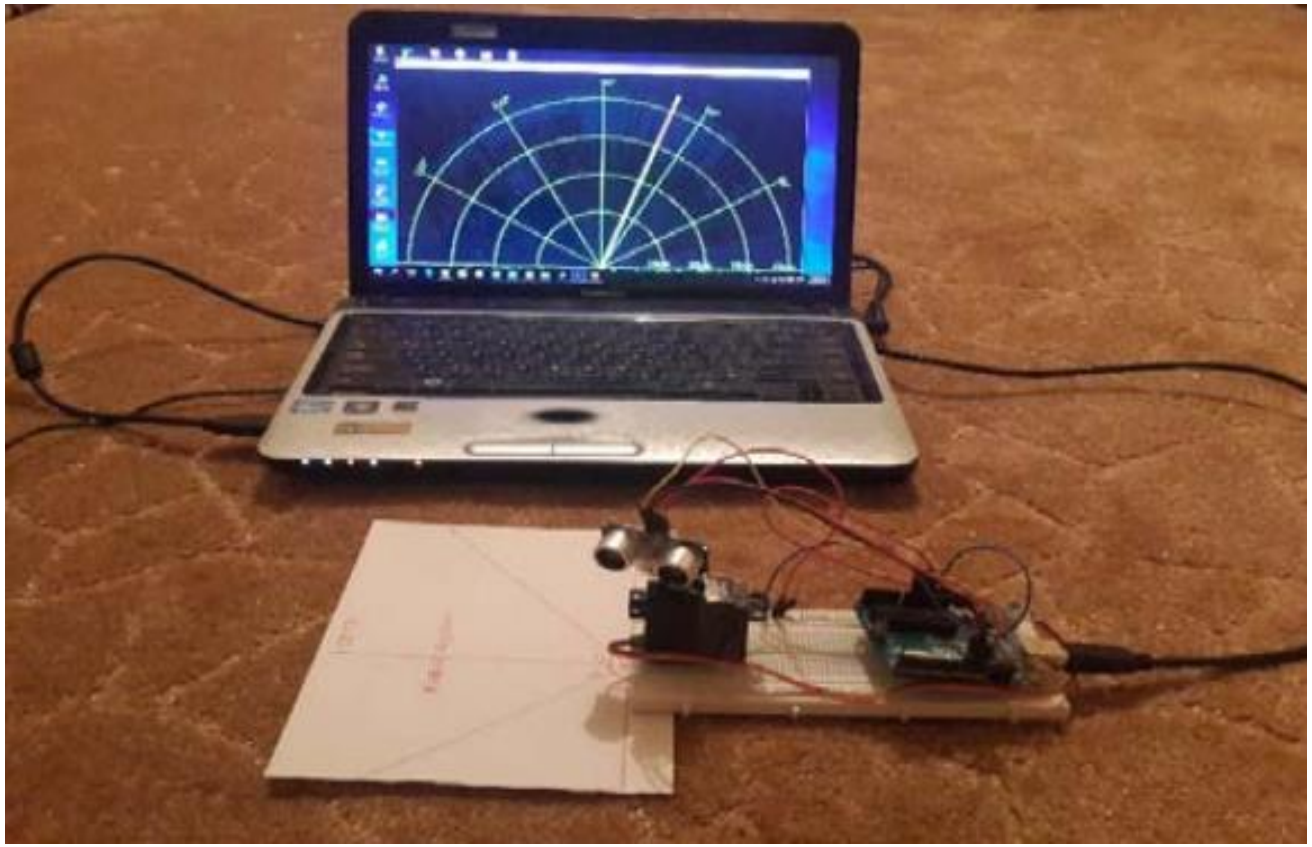


Fig. 8 Hardware model of the project

Results

2) The radar workspace is shown in Figure 9.

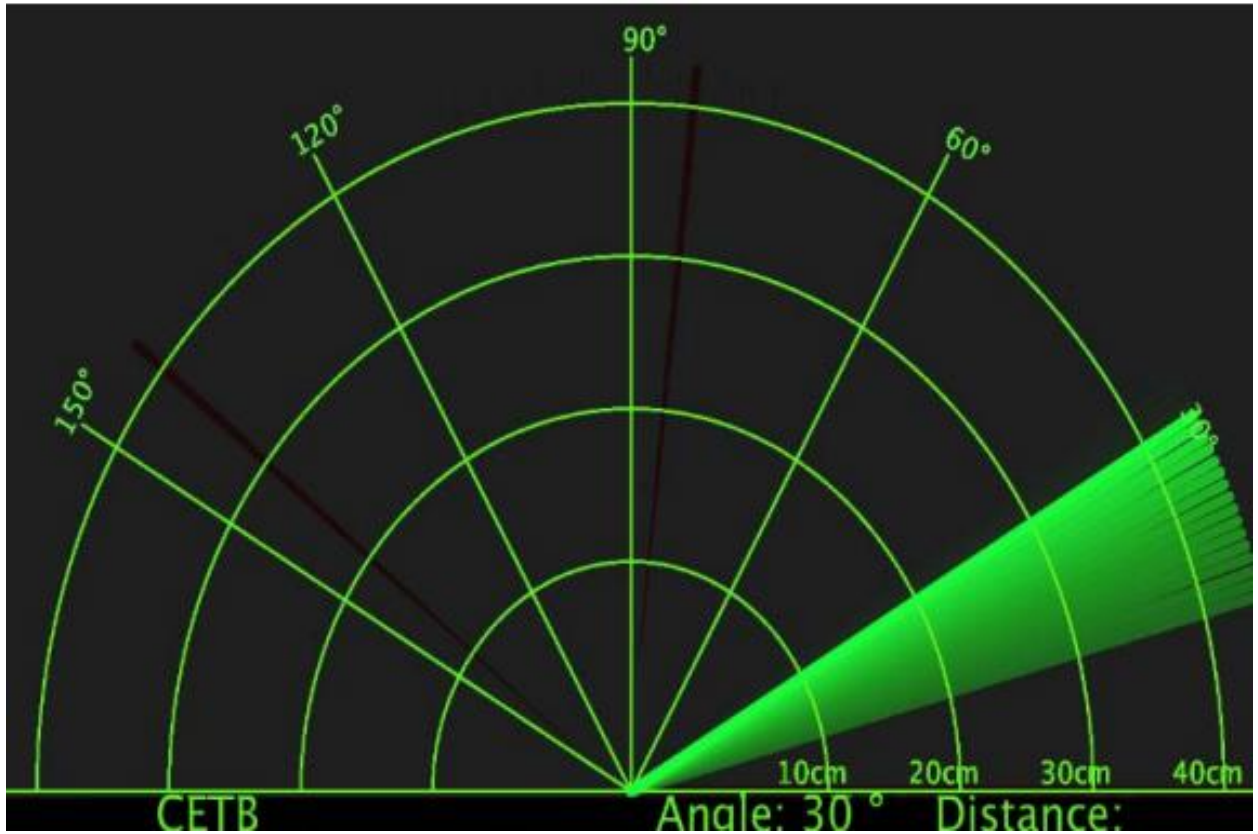


Fig. 9 Radar workspace

Results

3) Figure 10 illustrates the radar when

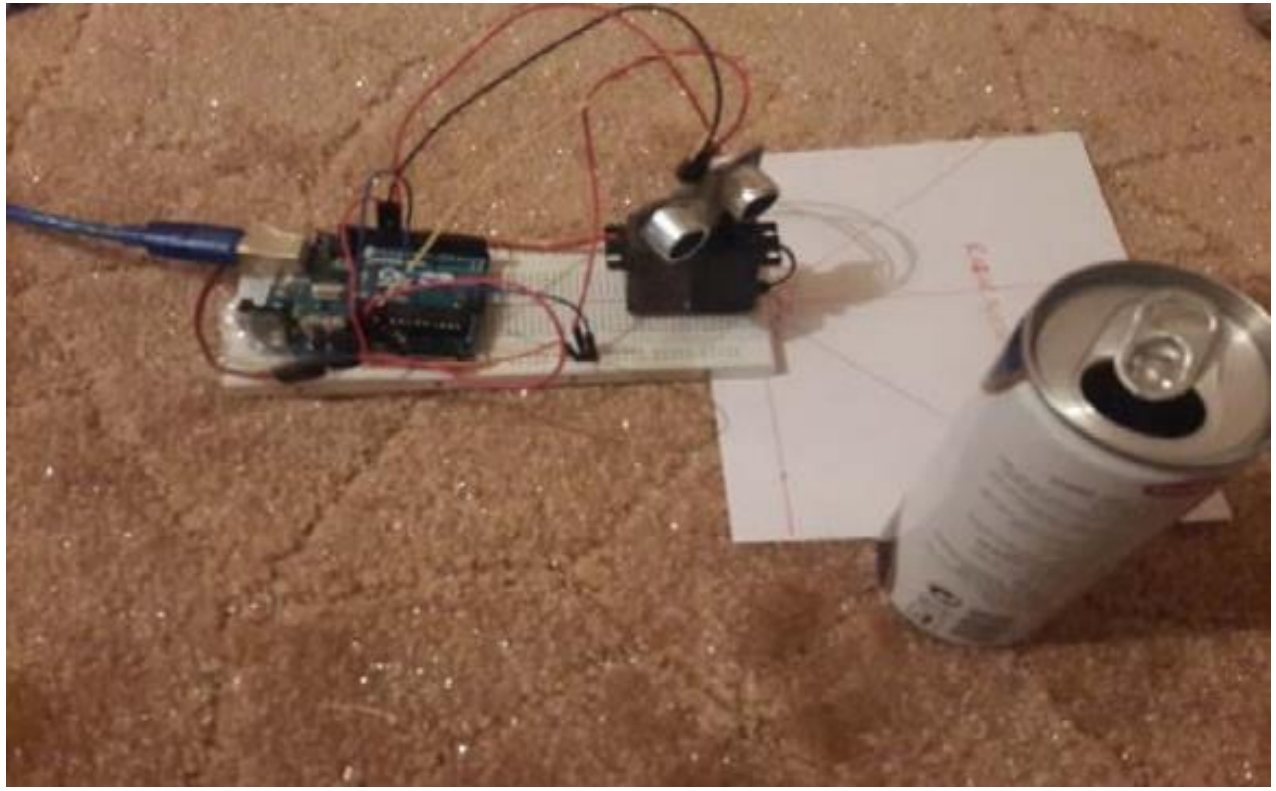


Fig. 10 Radar with object

Results

4) Figure 11 shows object radar information on radar workspace where the distance between object and radar is 11cm,

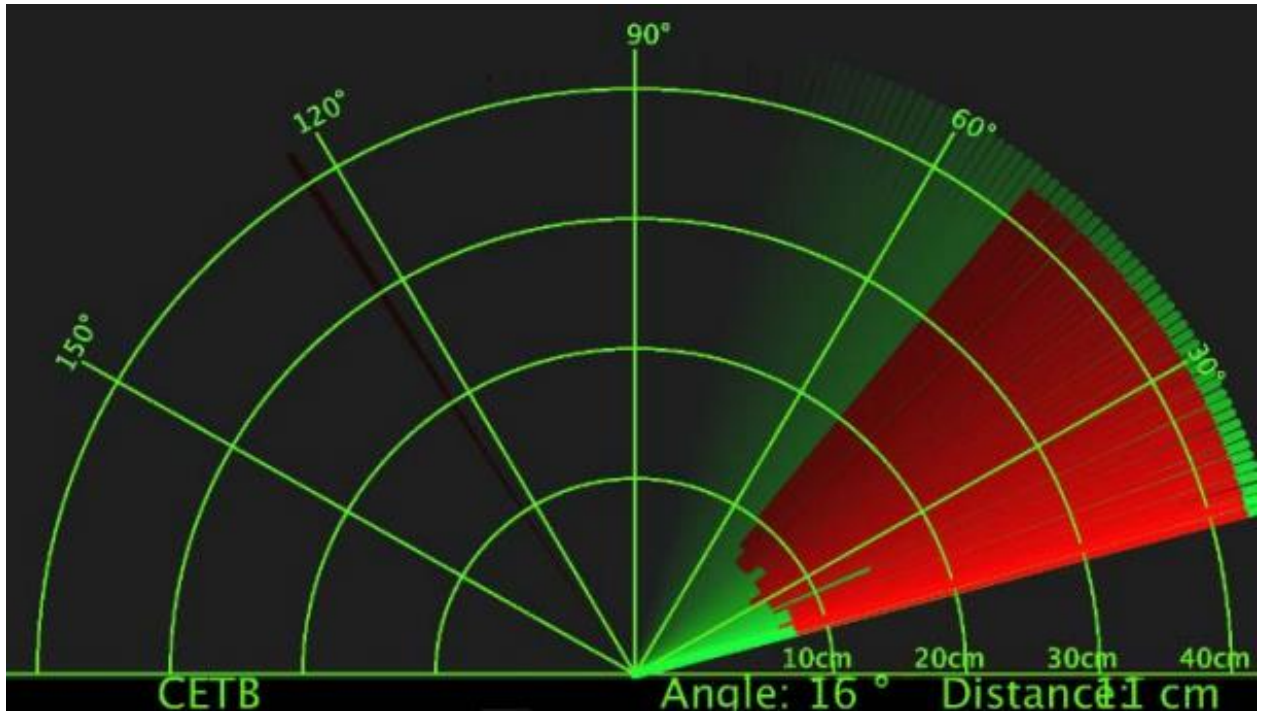
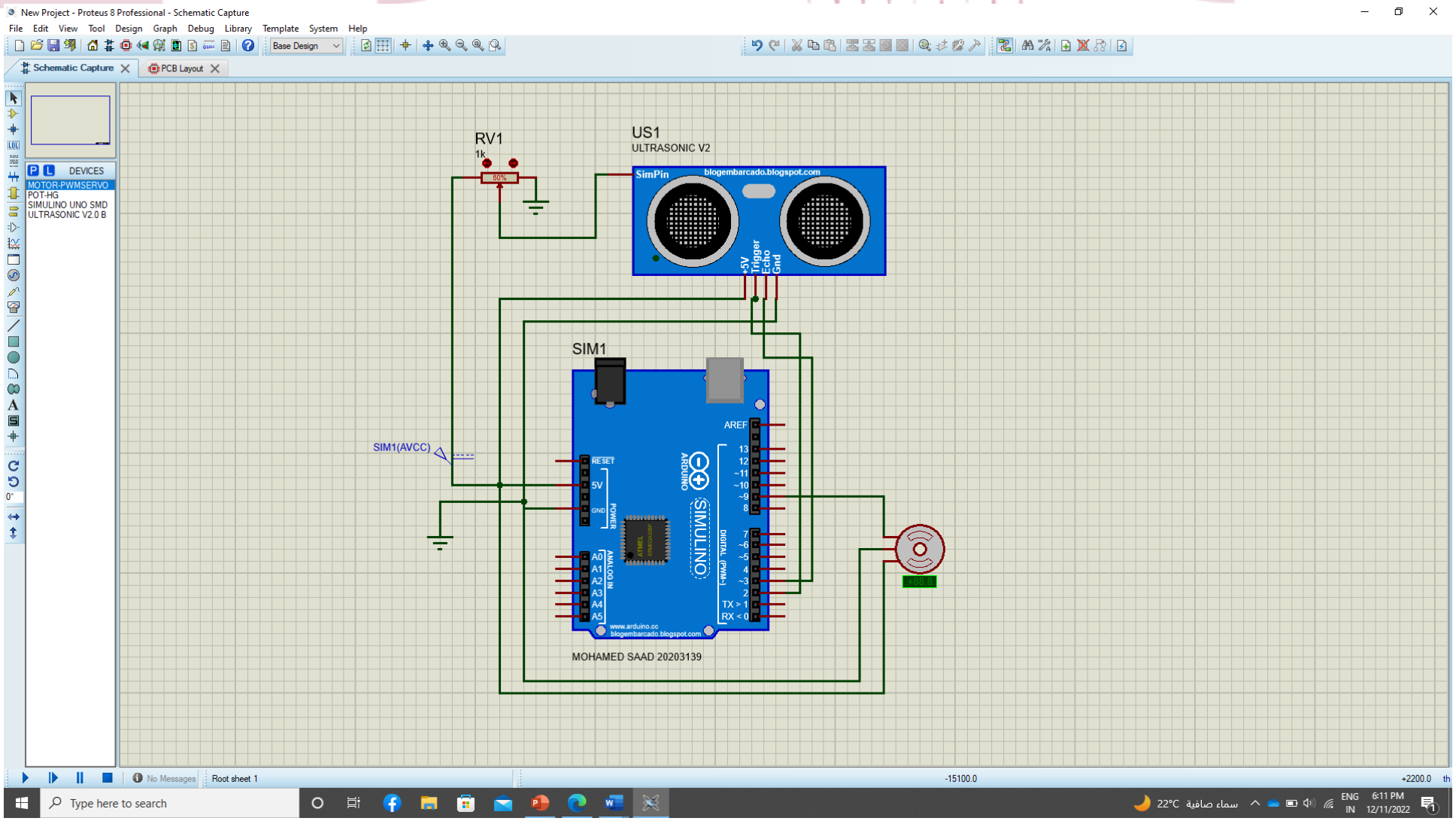


Fig. 11 Radar information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