

Hexray

Portable Subsurface Microwave Imaging System

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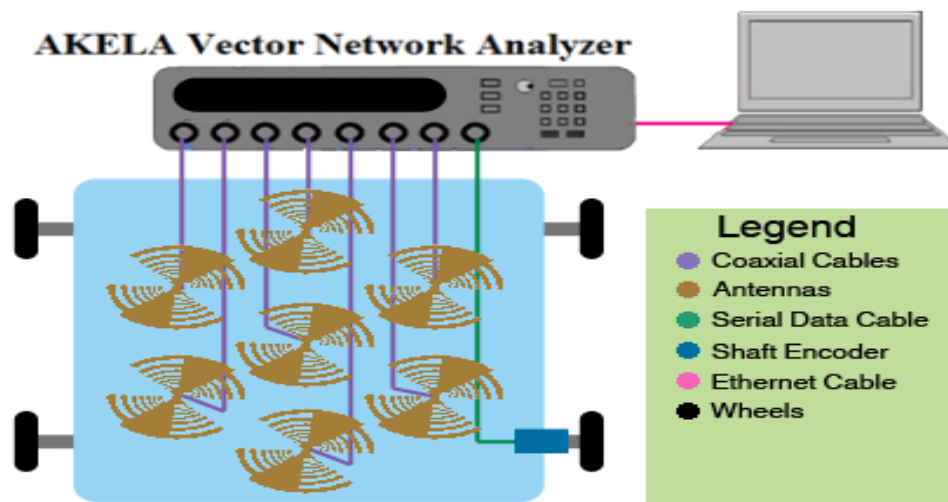


Figure 1: System overview

The current paradigm in ground penetrating radar involves linear arrays of large antennas, which can be bulky and hard to maneuver. We aimed to increase the accessibility of subsurface imaging with smaller antennas and a novel array architecture that has a smaller footprint and simplifies the imaging algorithm. We intend to foster new applications of this technology by making it easier to create an image of what lies beneath an area.

We use continuous microwaves because they propagate more energy into the ground, which allows our system to see targets underground. Continuous waves are periodic, so one cannot discern the time it took a reflection to return to the radar system directly from one frequency. We step through different frequencies to use the different wavelengths to pinpoint what the delay is, and use the delays for different antenna pairs to triangulate the targets. With these steps we can create a 3d array of points related to the intensity of reflections from each point, and display a slice of that data as a 2d image.

We have worked to consolidate these steps into a simple Matlab program that users can simply run to produce images from the data they capture onsite. We also integrated all the hardware into a product that the user can easily move around their site to collect the data. By making ground penetrating radar easier to use we open up this technology to a wide variety of uses, including archaeology and humanitarian post-war mine clearing.