Augmented Reality applied to Electronic Measurements

VirtUA: An Augmented Reality, Handheld Based, Virtual User Asistant for Testing

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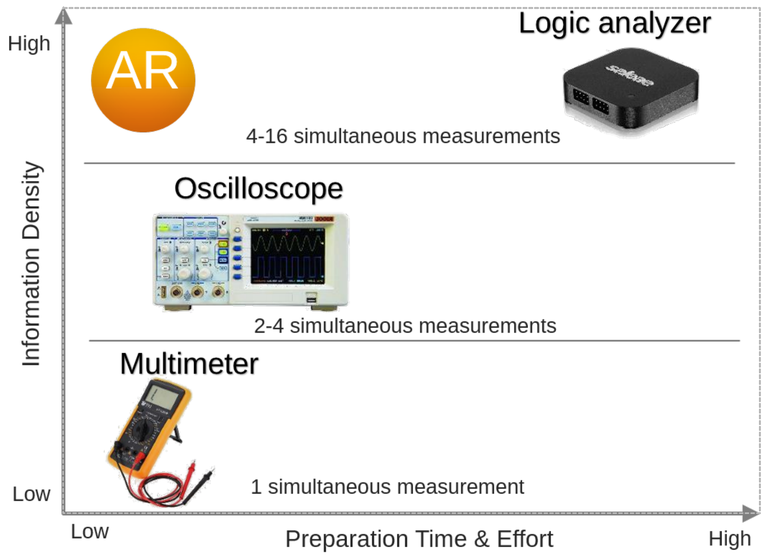
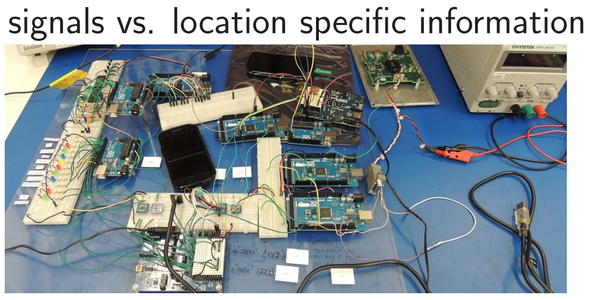
Why?

Electronic measurement devices lack simultaneous multiple real-time measurements with location-specific information.

- Multiple simultaneous electronic signals vs. preparation time



- Multiple electronic signals vs. location specific information



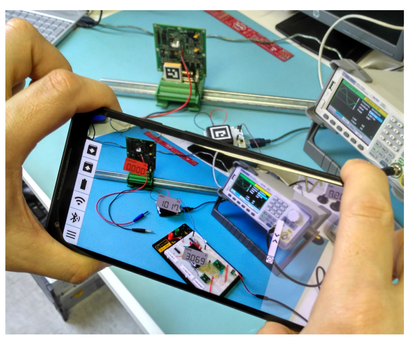
Increasing number of measurement signals leads to a loss of location of specific information because excessive cognitive load of testing engineers. This is the case in most space electronics AIT activities.

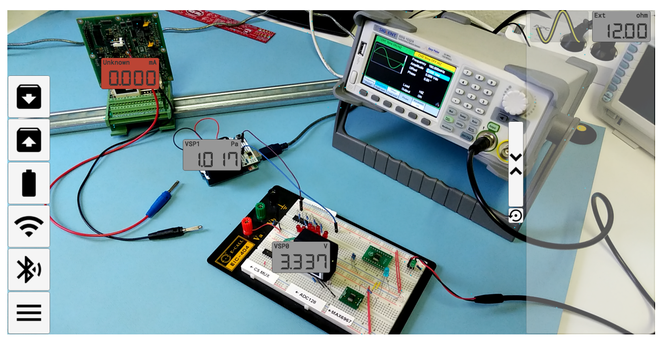
AR System Goals

Requirement	Choice
Multiple, simultaneous measurements	Multiple interconnected probes
Measurements shown in place	Place measurements in AR system
Avoid setup time and effort	SLAM based Handheld AR
Avoid cumbersome hardware	Use Android ARCore devices
Affordable system	Use of pre-existing handheld devices

What is VirtUA?

VirtUA is an Augmented Reality solution (Hardware and Software) to display multiple measurements in real-time and with location-specific information; measurements are displayed exactly where they are measured. It is a Simultaneous Localization and Mapping (SLAM) system based on the Handheld Augmented Reality (HAR) concept. No specific setup is required for any testing environment; only the VirtUA application has to be available in the handheld device.



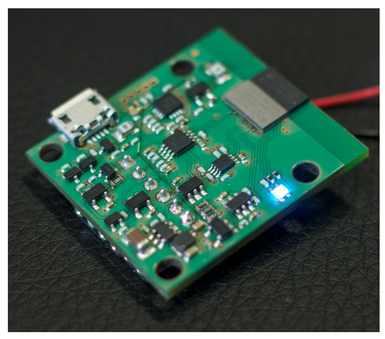


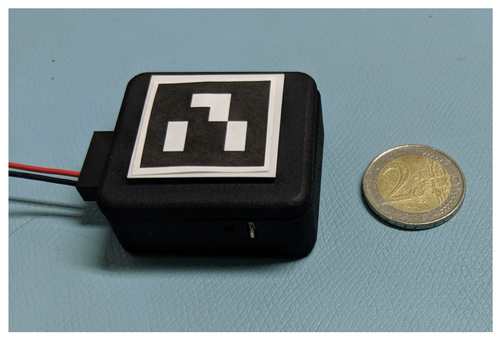
Handheld Device Software

The Software runs on a handheld device (Android smartphone or tablet) and it has been developed using the following COTS:

- OpenCV: Open Source computer vision software library. It detects and identifies the ArUco markers of each Smart Probe.
- ARCore: Google platform to extract 3D points from the image captured by the handheld device camera and track them in real-time (SLAM feature).
- Unity3D: 3D environments development suite. Used to superimpose the measurement fields and virtual buttons on the real-time image. It combines the data from OpenCV and ARCore to display each measurement on its corresponding ArUco marker.

Smart Probes

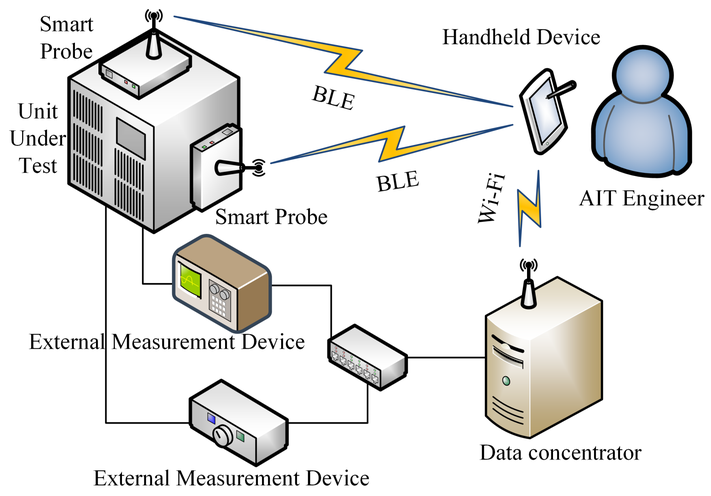




- Measure multirange voltage (0-5V, 0-10V, 0-40V)
- Communicate via Bluetooth Low Energy
- Supplies sensors (3V3 and 5V)
- Battery life longer than a working day
- Read directly I^2C sensors

Additional External Measurements

Through the data concentrator component (e.g., a computer) additional measurements from external devices (e.g., power supply, signal generator) can be integrated into VirtUA.



Measurement Processing

VirtUA reads JSON-based measurement log files and generates plots in a web-based application for later analysis of the measurements.

Acknowledgements

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