TED Talk: Update #2 Script

We are Team 4 and we are doing the millimeter-wave RADAR to detect the moisture content of green coffee beans.

So far we’ve been successful in interfacing with the XM125 (which is the radar module we’re using) and the A121 sensor using Acconeer’s A121 Exploration Tool. We’ve also managed to successfully interface the Exploration Tool with a Python library, so now we are able to see and manipulate the received wave data in Python.

The received data is in-phase/quadrature or I/Q data, which is essentially a fancy way of saying complex values, so right now we’re looking into interpreting that data using phase shift, signal attenuation, and reflection properties in order to find the relative permittivity of the beans.

We’re also looking at different methods of using that permittivity to determine the moisture content of the beans - this might involve machine learning, linear regression models, and/or empirical models.

Other than that, we’ve created 2 prototypes so far, both with slightly different geometries which we’ve been testing. It’s been a bit trial and error figuring out the difference between noise that we might be seeing and actual attenuation of the signal from the green coffee beans, so we’re currently tinkering with the radar’s settings, shielding methods, different lenses, and looking into different material types with dielectrics that won’t affect our readings.

So far we’ve been using PETG for our prototypes which has yielded mixed results, but we’re looking into maybe using Teflon as its dielectric is relatively stable across a wide range of temperatures and frequencies.

We have been able to detect attenuation caused by the presence of the green beans (which is good progress), but it’s been inconsistent and we’ve used various sample sizes of beans. So that’s another thing we’re working on dialing in alongside the radar’s settings, material types, etc.

Oh, we’ve also got a functional stepper motor for rotating the track that the beans lay on because we’re thinking that taking multiple readings and averaging the values is something worth trying. Time will tell.