FingerIO: Using Active Sonar for Fine-Grained Finger Tracking

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Wearable Devices have Smaller Input Surface

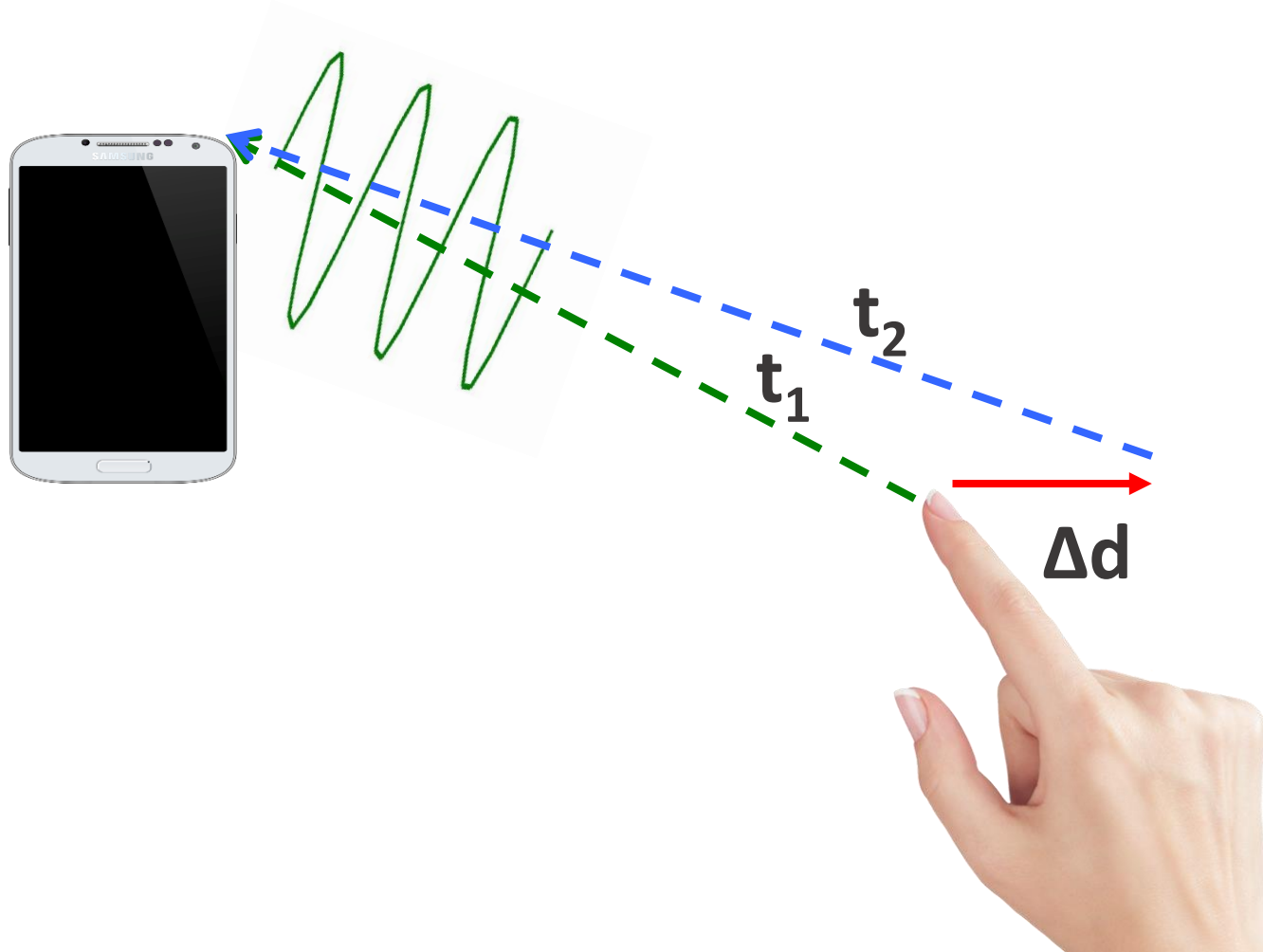Can we accurately track a user's finger around a device?

FingerIO

Enables fine-grained finger tracking within 1 m^2 around the device without instrumenting the user's fingers with sensors
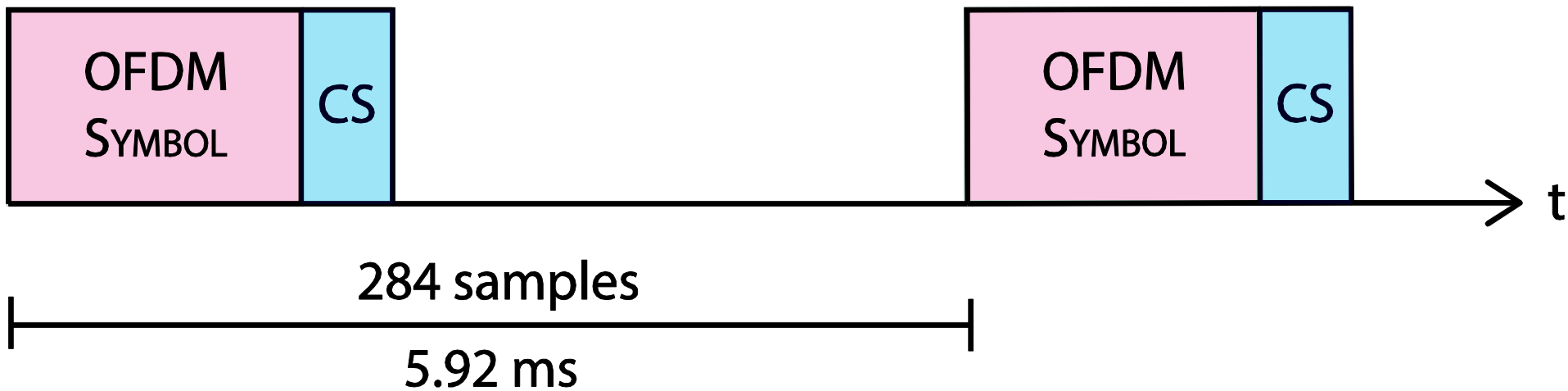
Detects the 2-D location of the finger with an accuracy of 1 cm using an off-the-shelf smartphone and a smart watch prototype

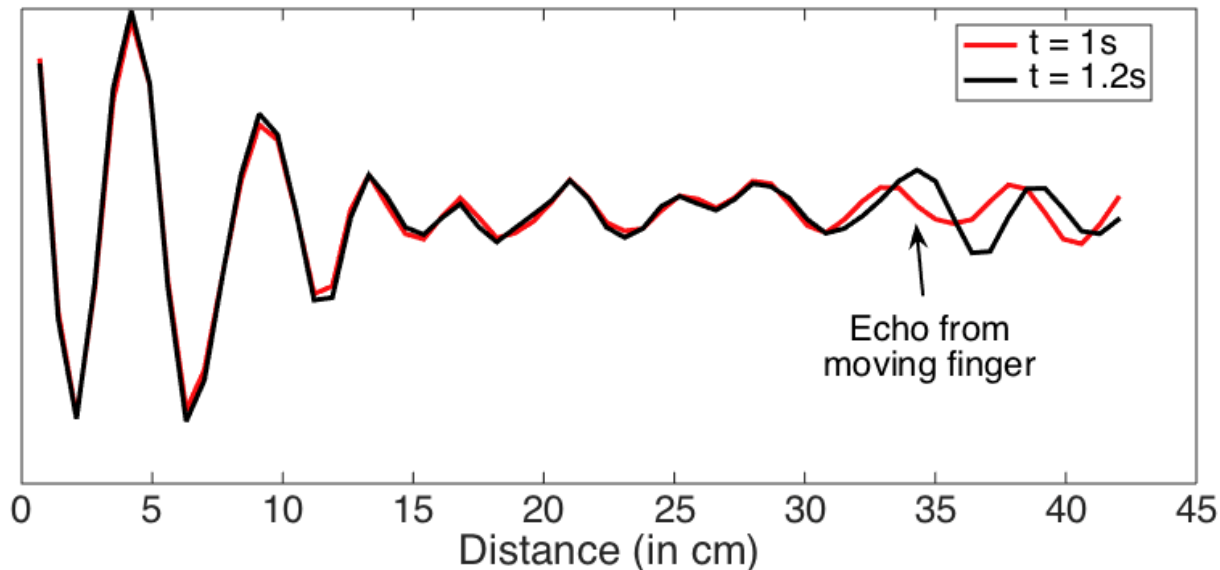Works with similar accuracies in the presence of occlusions

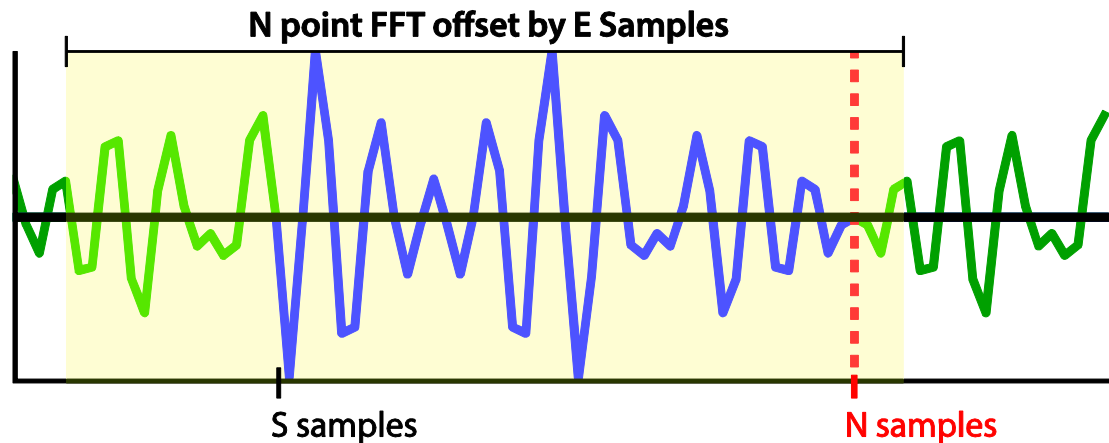Key Idea: Transform the Device into Active Sonar

OFDM Signal improves Tracking Accuracy

OFDM SYMBOL | CS | | OFDM SYMBOL | CS | → t

284 samples

5.92 ms

Correlation gives an error of 3-4 samples (> 2 cm)

Legend: t = 1s (red), t = 1.2s (black)

Echo from moving finger

Distance (in cm)

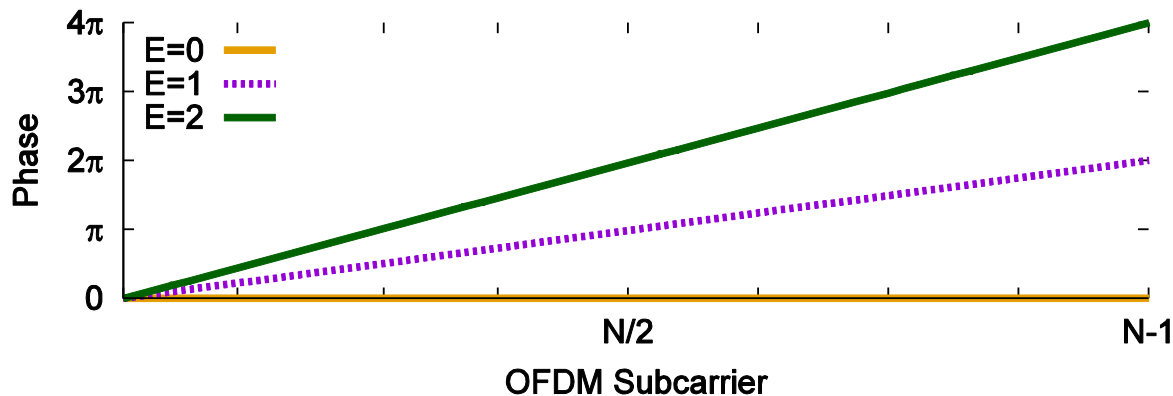# OFDM Signal improves Tracking Accuracy
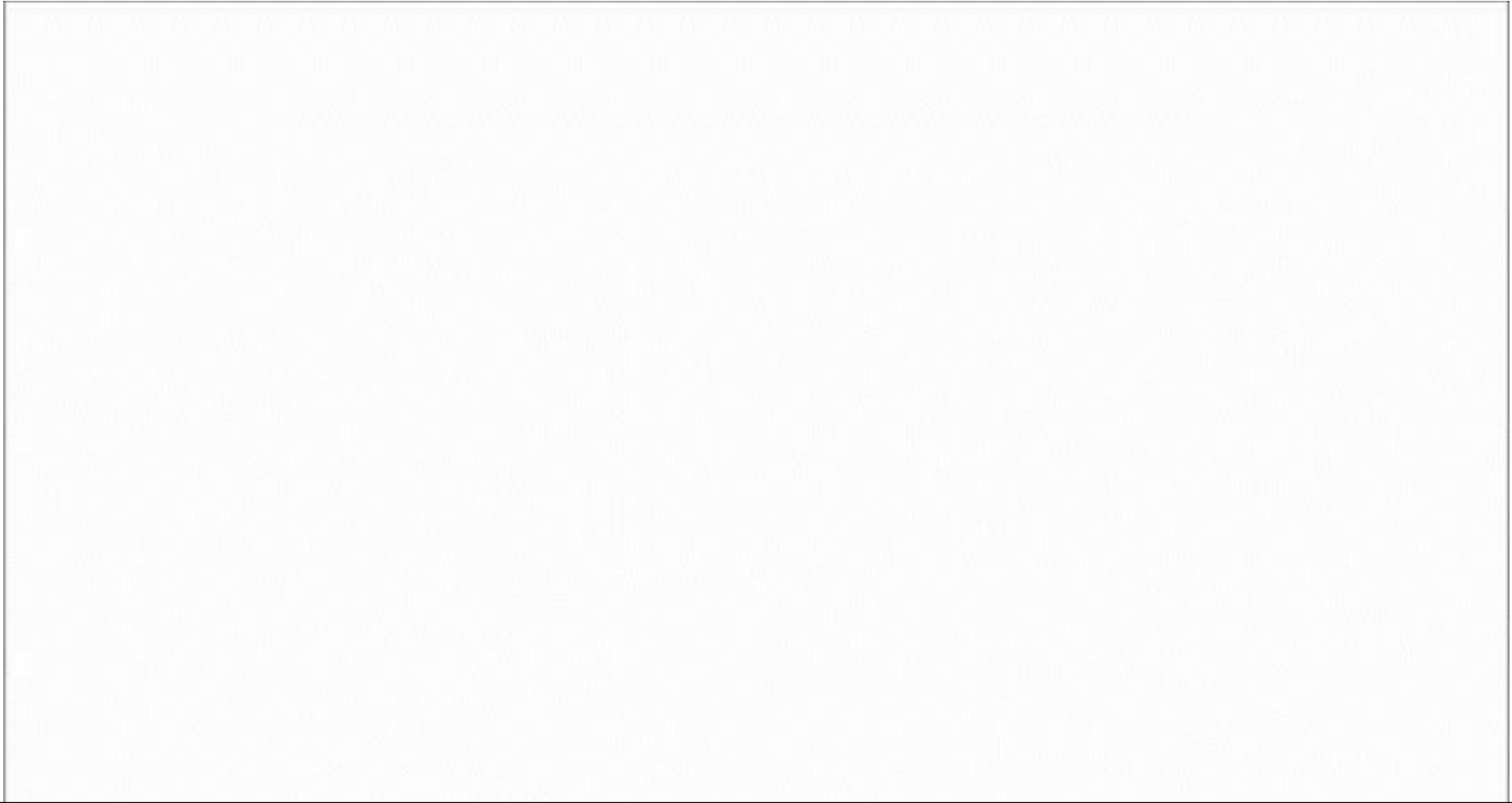

N point FFT offset by E Samples

S samples

N samples

Offset for phase change to measure accurate distance

Each sample error translates to a unique phase change

FingerIO can track the user's finger with an accuracy of 1 cm even in the presence of occlusion

Demo