Mezuri: Opo – Face-to-Face Interaction Sensing

William Huang, Ye-Sheng Kuo, Pat Pannuto, Prabal Dutta

U.S. GLOBAL DEVELOPMENT LAB Powered by USAID

UNIVERSITY OF MICHIGAN

System Overview

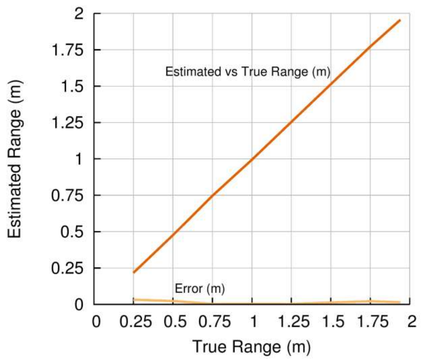
Opo is a wearable sensor system which provides detailed face-to-face interaction distance and duration in a wearable, easy to deploy manner. Previous systems provide either detailed interaction data, or wearability and easy deployability. Opo accomplishes both by using **UL wakeups** instead of wireless discovery protocols.

Wearable

1.6 cm

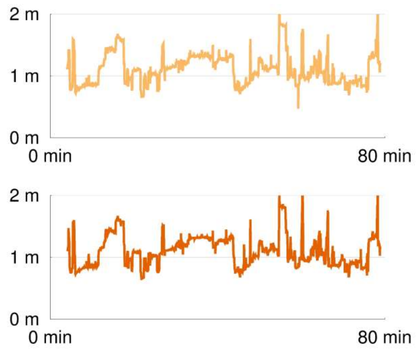
Small form factor

Accurate



Ranging Accuracy Test

Detailed

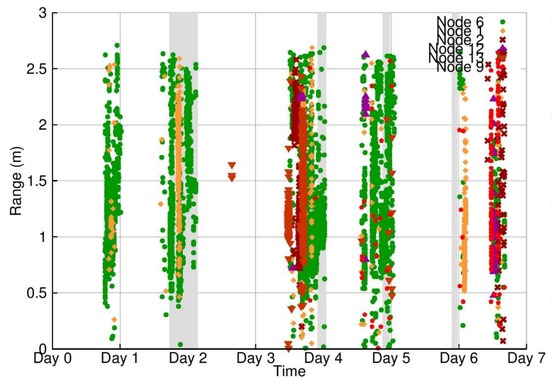


Two Person Interaction

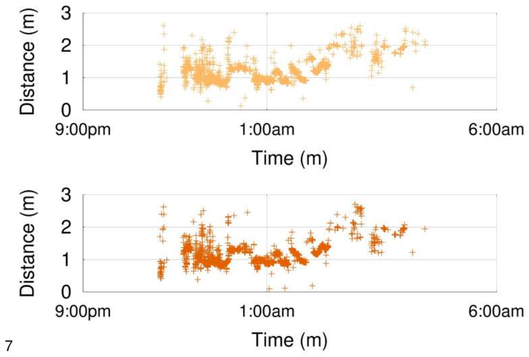
Comparison to Other Systems

System	Ranging Method	Ranging Accuracy	Infrastructure	Time Resolution	Size	Battery Size	Battery Life	Tested on People
WREN [21]	RF Scan	200 cm	No	20 s	13 cm^2	180 mAh	16 hr	Yes
TelosB [1,50]	RSSI Sensing	200 cm	No	20 s	20 cm^2	4000 mAh [a]	16 hr	Yes
Social fMRI [9]	Bluetooth Scan	500 cm	No	300 s	N/A	N/A	N/A	Yes
WASP [52]	RF ToF	50 cm	Yes	.04 s	N/A	6.5 Ah	10 hr	Yes[b]
Cricket [46]	UL/RF TDoA	10 cm	Yes	1 s	40 cm^2	4000 mAh [a]	N/A	Yes
iBadge [40]	UL/RF TDoA	10 cm	Yes	N/A	38.5 cm^2	N/A	5 hr	Yes
RADAR [11]	RF Fingerprinting	2500 cm	Pseudo[c]	N/A	N/A	N/A	N/A	Yes
Dolphin [36]	UL ToF	24 cm [d]	Yes	13 s	N/A	N/A	N/A	No
Future UL [45]	UL AoA, ToA	sub-cm	Yes	1 s	N/A	N/A	N/A	No
Opo	**UL/RF TDoA**	**5 cm**	**No**	**2 s**	**14 cm^2**	**40 mAh**	**93 hr**	**Yes**

Tested on People



A Week as a PhD Student



2 People Partying all Night

Limitations

- Duration sensing suffers in hyper dense scenarios
- Tradeoff between group interaction performance and false wakeups, which drain power
- Tradeoff between ensuring people are facing each other (reducing false positives), and ensuring that every interaction is sensed

Future Work

Integration with smartphones

- Provide BLE data backbone to the cloud
- Provide contextual data, such as GPS location

Data Analysis

- Crowd and cluster detection
- Cross-validation and filtering
- Large-scale network interactions

} ***Mezuri***

All materials, software, and hardware, developed for this work are freely available and released to the public domain at http://lab11.eecs.umich.edu and http://github.com/lab11

San Francisco, CA
Berkeley, CA
November 8-10, 2014