Ambient Backscatter

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[1] Seminar-II

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Introduction

- Small computing devices are increasingly embedded in objects and environments such as thermostats, books, furniture, and even implantable medical devices
- A key issue is how to power these devices as they become smaller and numerous; wires are often not feasible, and batteries add weight, bulk, cost, and require recharging or replacement that adds maintenance cost and is difficult at large scales.

Continue..

- As devices get smaller, providing room for wires and batteries becomes more expensive.
- Came up with a novel concept that requires no batteries or wires.

What is Ambient Backscatter

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- Backscatter: A reflection of waves, or signals back to direction from which they came.
- A new communication primitive where devices communicate by backscattering ambient RF signals.
- No batteries.

History

- Ambient backscatter uses existing radio frequency signals, such as radio, television and digital telephony, to transmit data without a battery or power grid connection.
- Each such device uses an antenna to pick up an existing signal and convert it into tens to hundreds of microwatts of electricity.

Working

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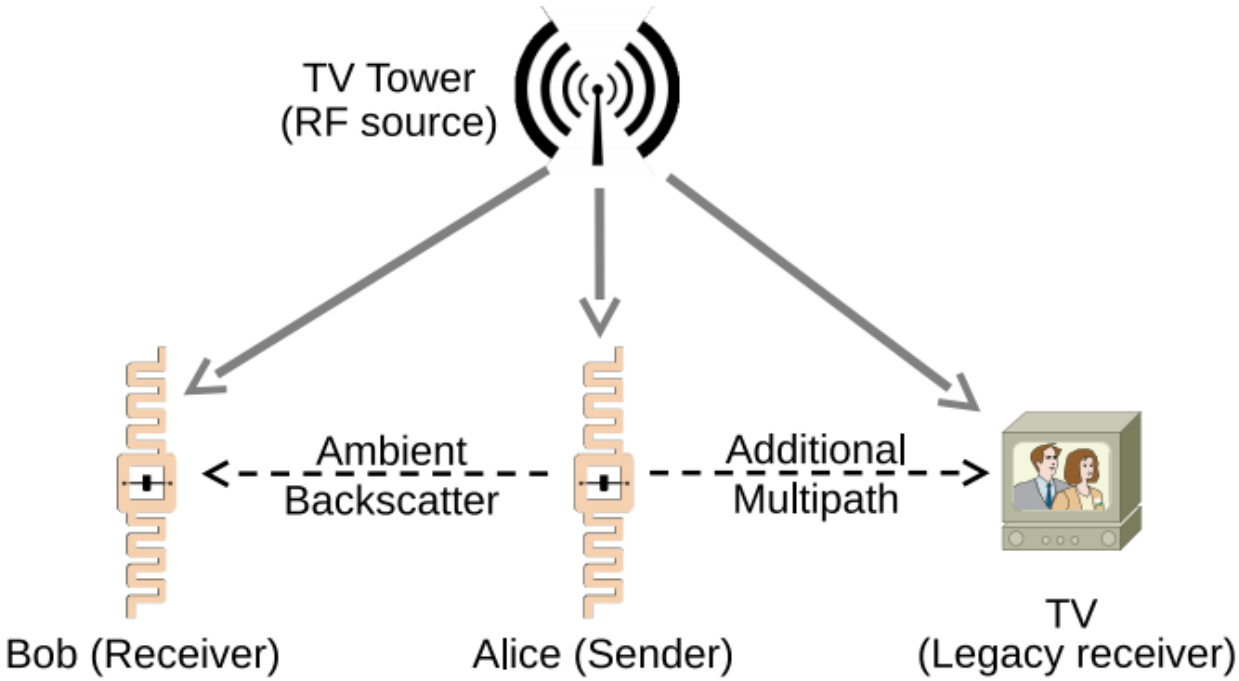

Figure: Working of Ambient Backscatter

Example:

- Two AB devices named Alice and Bob, and a TV Tower in an Urban environment as the ambient source.
- Alice wants to send a packet to Bob.
- She does this by backscattering the ambient RF signals to convey the bits in the packet.

Continue..

- Ambient source (TV Tower) sends out RF waves.
- Ambient Backscatter devices can use these signals to power itself and reflect signals By reflecting or not, they transmit a 0 or a 1
- Bob can sense the backscattering signal changes and decode Alices packet.
- Also creates an Additional Multipath

Design

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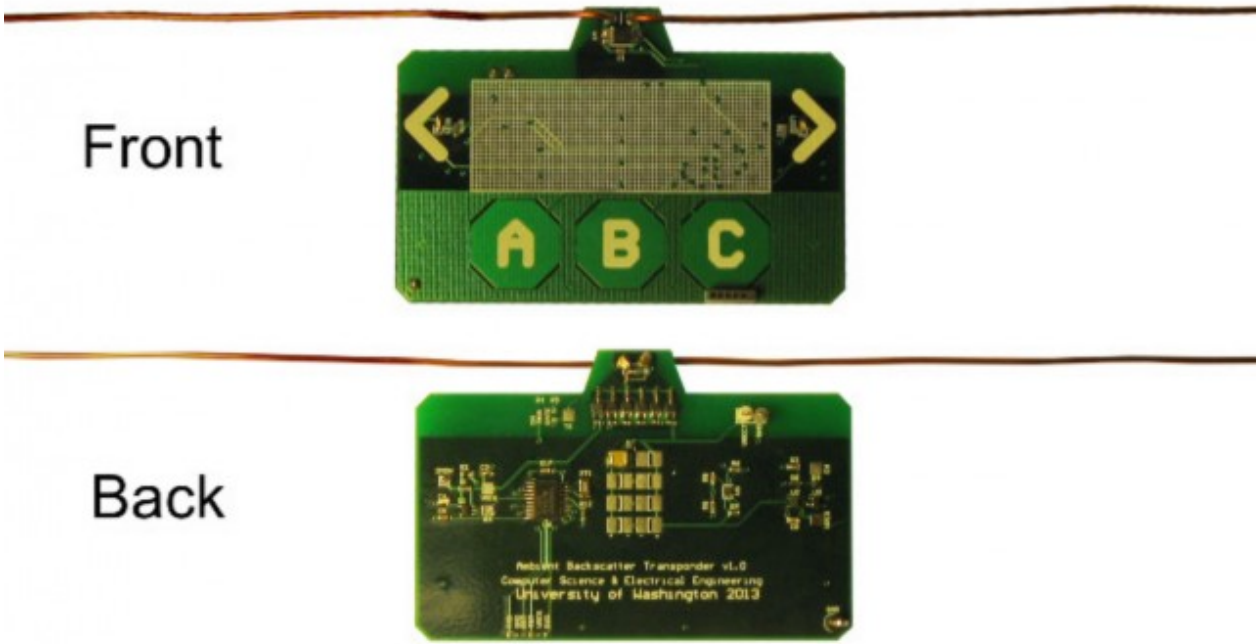

Figure: Design of Ambient Backscatter

Prototype in action

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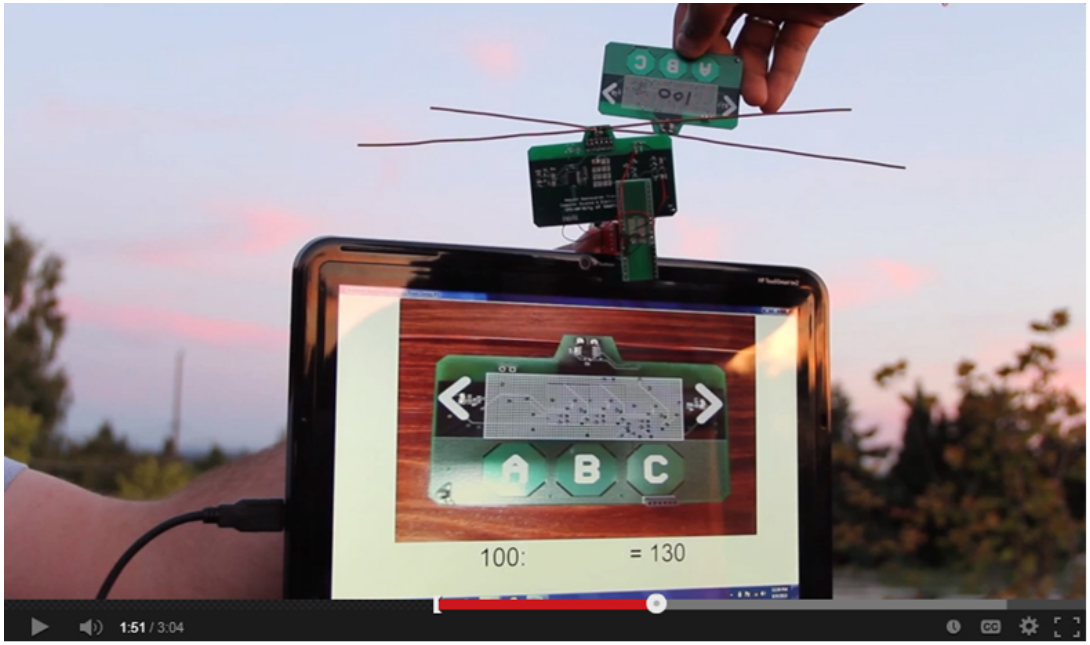

Figure: Prototype in action

Application's

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- Embed into building, bridges, infrastructure to alert Engineers about potential weaknesses.
- Because they are require no batteries, can be imbedded into materials like concrete
- Devices built into couches and can send an alert to the users phone that they left their keys on the couch or table

Application

- Ambient Backscatter devices can be used for inventory systems. To alert when stock needs refilled.
- More research needed to speed up transmission Can be possible to improve this using different signal strengths

Conclusion

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- Computers were tethered by their power cords and were rendered useless without a nearby power outlet.
- Wireless communication combined with battery packs liberated these devices for short periods of time so that they could compute and communicate, untethered, as long as their batteries were occasionally recharged or replaced.

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Any Queries?

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Thank You!