

# Voice-Control of Consumer Electronics in Intelligent Homes

TALKING TO APPLIANCES in a home has been a science fiction staple for decades. Today, a wide range of companies, including giants like Microsoft, Electrolux, and Ericsson, are developing and selling technology for so-called “Intelligent Homes”. Speech interfaces are a desired feature, but has so far been lacking from commercial products.

This absence is due to the many practical issues that must be overcome to enable the user to talk to the things around her.

Voxi has developed a solution to these problems, based on the Bluetooth wireless technology. The solution is useful in many environments, both inside as well as outside the home, for example inside the car and in the office

This paper will compare available solutions for providing speech interfaces to consumer electronic devices in a home.

## Speech Interface in each Device

One option is to integrate speech recognition into the various consumer electronic devices, such as TVs and stereos. However, this has several disadvantages.

Speech recognition requires much processing power which would substantially raise the price of consumer electronic devices.

Each device would need its own microphone solution, and the user would have to walk up to each device’s microphone to control it.

Additionally, each device would probably have a different way of interacting with it. Some might be command-based, for example using single-word commands corresponding to the device’s controls. Others might have a natural-language interface that would let you say “Record the X-files tonight” to your VCR. This discrepancy in user-interaction styles would be confusing for users.

## Built-in Microphones and a Server

An alternative solution is to integrate microphones and a speech recognition server in the home.

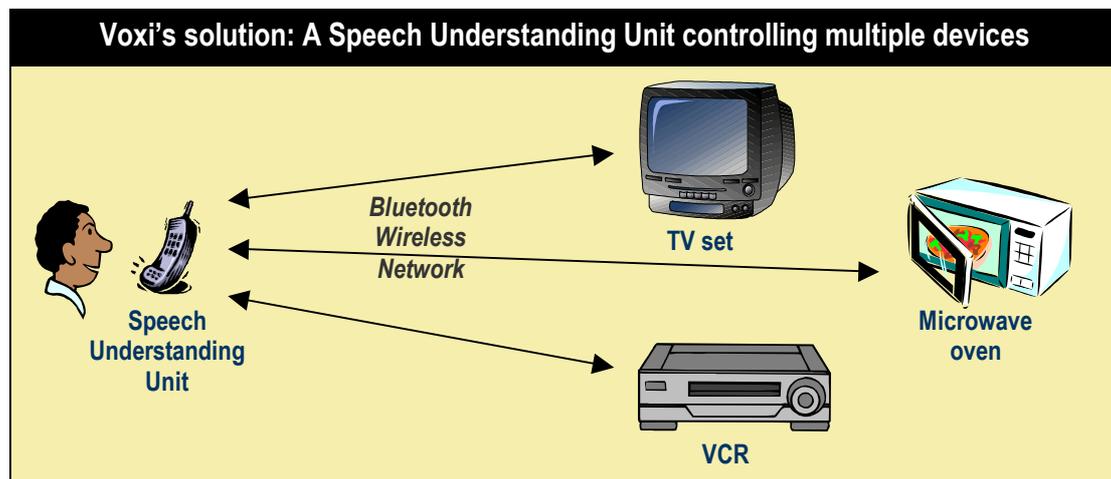
Modern array microphones can record users at up to one meter from the microphone with sufficient quality for speech recognition.

However, this is also an expensive solution – one array microphone costs about \$150, not including the installation and wiring for these in different rooms of the house.

Also, the speech recognition server must be aware of, and connected to, all devices which it should control. There is today no established solution for how this should work.

## Voxi’s Bluetooth Solution

Bluetooth is a wireless networking standard that lets devices within 10 meters of each other communicate by forming so-called pico networks. Bluetooth transceivers are expected to cost \$5 in volume production.



## The Speech Understanding Unit controlling devices in many different environments



In intelligent homes



In cars



In the office



Out hiking with a  
body area network

Voxi proposes a Bluetooth profile (communication protocol), for appliances to publish which words and concepts can be used to control them.

In this solution, a portable wireless device (the Speech Understanding Unit, or SUU) contains the speech recognition and natural-language understanding capabilities. The SUU can be a separate device, or part of another device such as a mobile phone or a headset.

The SUU discovers which Bluetooth enabled devices are in the vicinity, and which words can be used to control them. Each appliance only needs to be equipped with a list of the words that can be used to control it, and a Bluetooth transceiver.

When a new appliance is bought, it does not need to be connected or configured, but will be discovered by the SUU.

All appliances are controlled in the same context-free natural-language style typical of Voxi's Intelligent Speech Interfaces.

When the user with the SUU leaves her home and enters her car, the SUU will discover Bluetooth-enabled units in the car, and she can continue to control the units in her vicinity.

Even when hiking out of range of modern infrastructure, the Bluetooth can be used to form a so-called Body Area Network, whereby the user can query her personal digital assistant without using her hands or eyes.

This solution has only been made possible by Voxi's natural-language understanding patent-pending technology, and is itself covered by a pending patent.

### Summary

Controlling appliances by speech poses practical problems which have not found a good solution.

Voxi has combined its speech interaction technology with the Bluetooth wireless network standard to create a unique, practical, and cost-efficient way of controlling consumer electronic devices by using the most natural user interface of all – conversational speech. 

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