Voice Controlled Home

Our company has developed voice-controlled smart home device to connect home appliances with our voices.

We are the connection between you and your home!

The Problem

The Solution

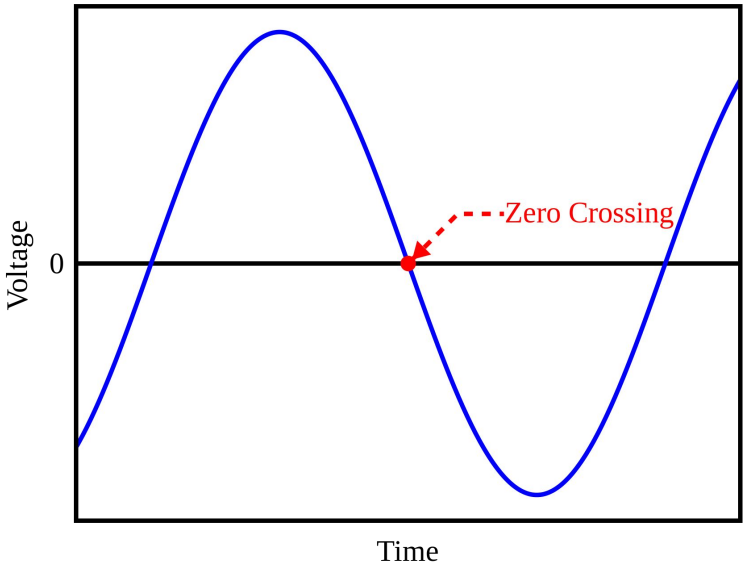
Existing Solutions

Our Solution

- Low power/performance MCUs
- On chip voice recognition
- No internet/wifi connection needed
- High configurability

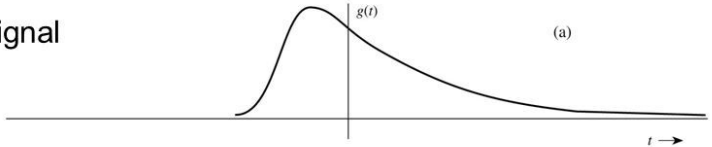
Our Approach

- Active clipping
- Zero- Crossing
- Total Energy
- Length
- Total Energy/ Length
- Energy Beam
- Statistical Comparison

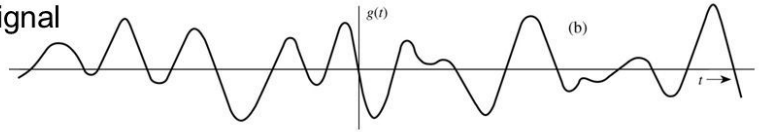


Signal Energy and Power

Energy Signal



Power Signal



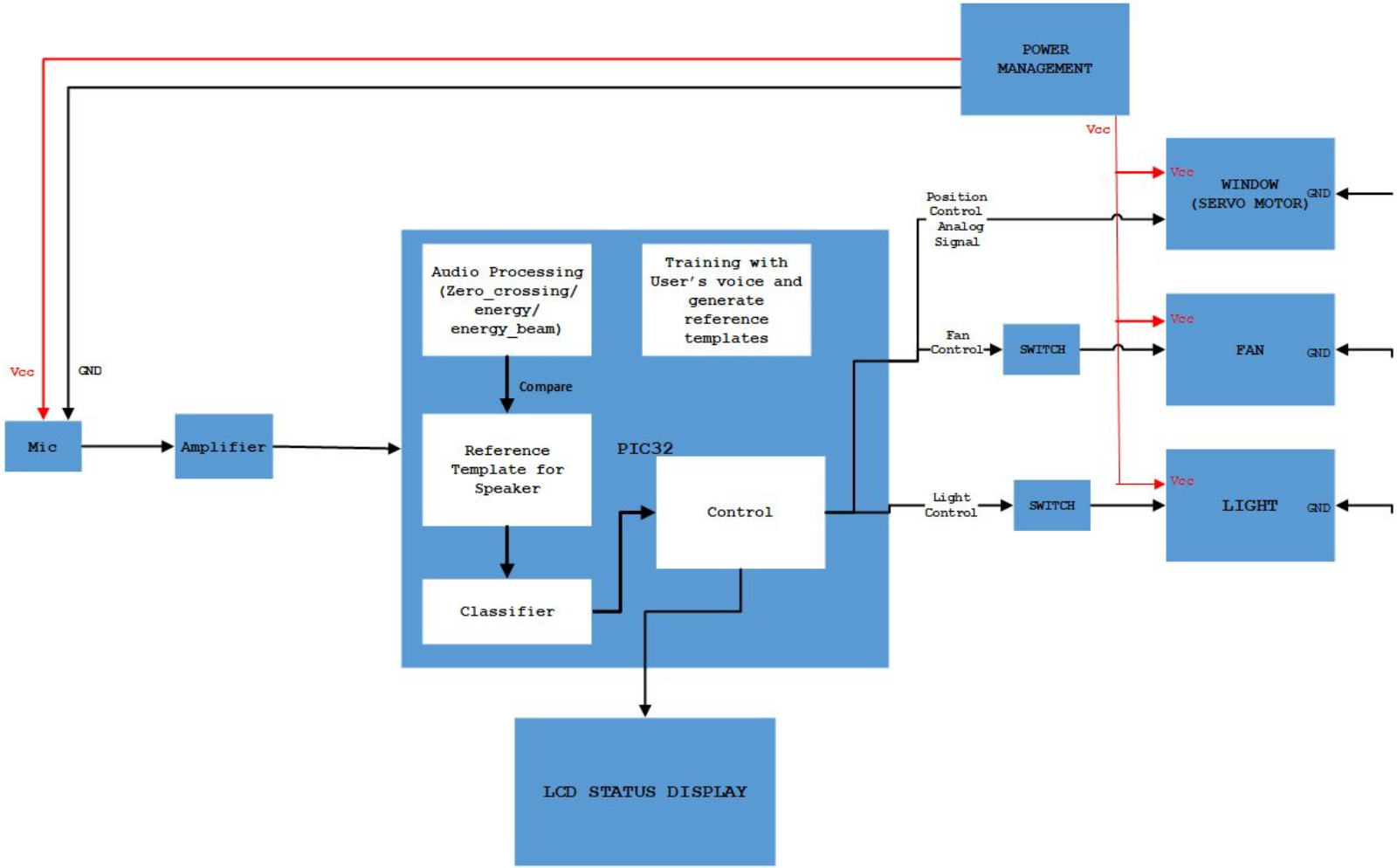
Energy

$$E_x = \int_{-\infty}^{\infty} x^2(t)\,dt \qquad E_x = \int_{-\infty}^{\infty} |x(t)|^2\,dt$$

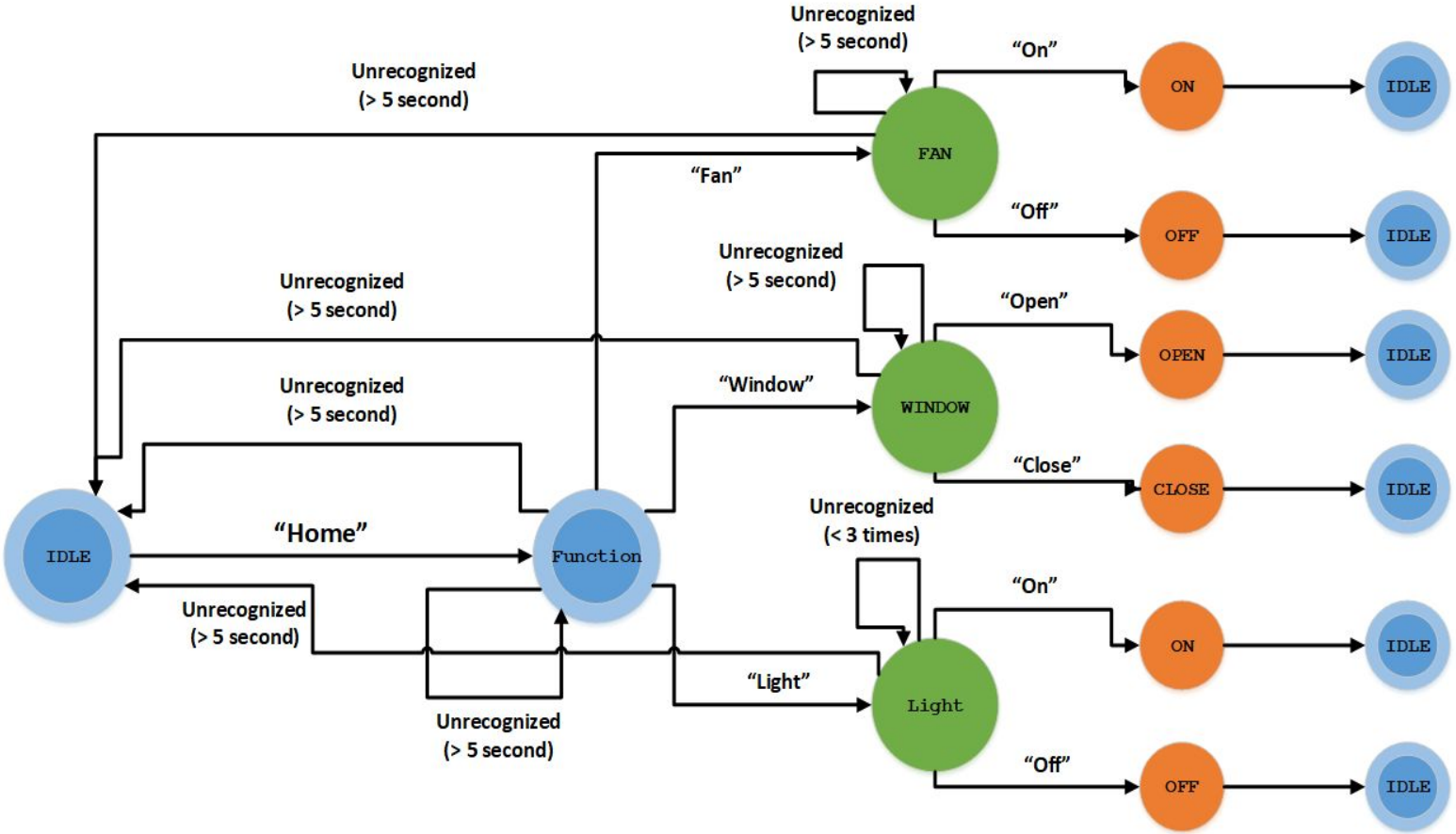
Power

$$P_x = \lim_{T\to\infty} \frac{1}{T} \int_{-T/2}^{T/2} x^2(t)\,dt \qquad P_x = \lim_{T\to\infty} \frac{1}{T} \int_{-T/2}^{T/2} |x(t)|^2\,dt$$

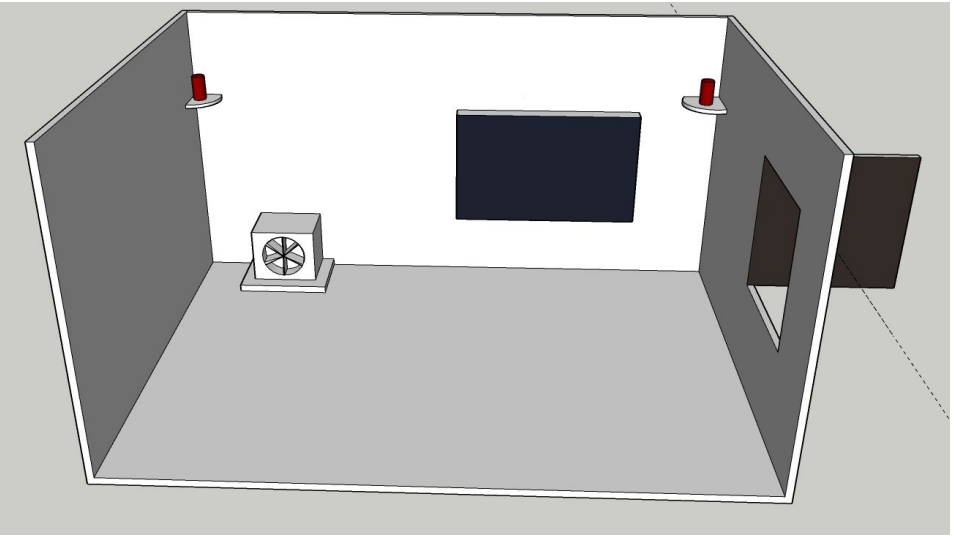
System Structure



State Diagram



House Prototype



Initial Testing

Tested algorithms on Matlab for First Level Commands

Command	zero_crossing	STD	Energy	STD	Energy_beam
Light	1614	328	635	265	[96,307,190,36,2.5,0.64]
Music	1356	102	644	143	[46,202,220,56,106,10]
Fan	2691	495	165	108	[1.26,20, 92, 42, 8.6, 0.87]
Window	707	64	392	84	[47, 174, 71.68.27.2.28]

Initial Testing

Tested algorithms on Matlab for Second Level Commands

Command	zero_crossing	STD	Energy	STD	energy_beam
On	941	75			
Off	3182	517			
Open	850	92			
Close	3186	183			
Play	1445	171			[2,162,304,181,46,5.2]
Stop	3251	208	331	82	[4.1,19,37,193,72,5]
Next	3057	319	539	152	[79,350,83,9.86,9.7,2.8]
Previous	3352	293	1223	374	[96,359,368,157,191,39]

Testing On PIC

https://drive.google.com/file/d/1mjizZURVcMMvC3HkkfmFGNlPOKPdYuHj/view?usp=sharing

Results

https://bit.ly/2EnZpEd
https://bit.ly/2STHkSq

Challenges

- Limited performance and storage of PIC32
- User dependency
- Sampling frequency
- Small difference between words
- External factors