



Andrea Audio Test Labs

**Andrea's Audio Filters
VS
Intel Speech Enabling Developer Kit
on the Raspberry Pi**

17 April 2018

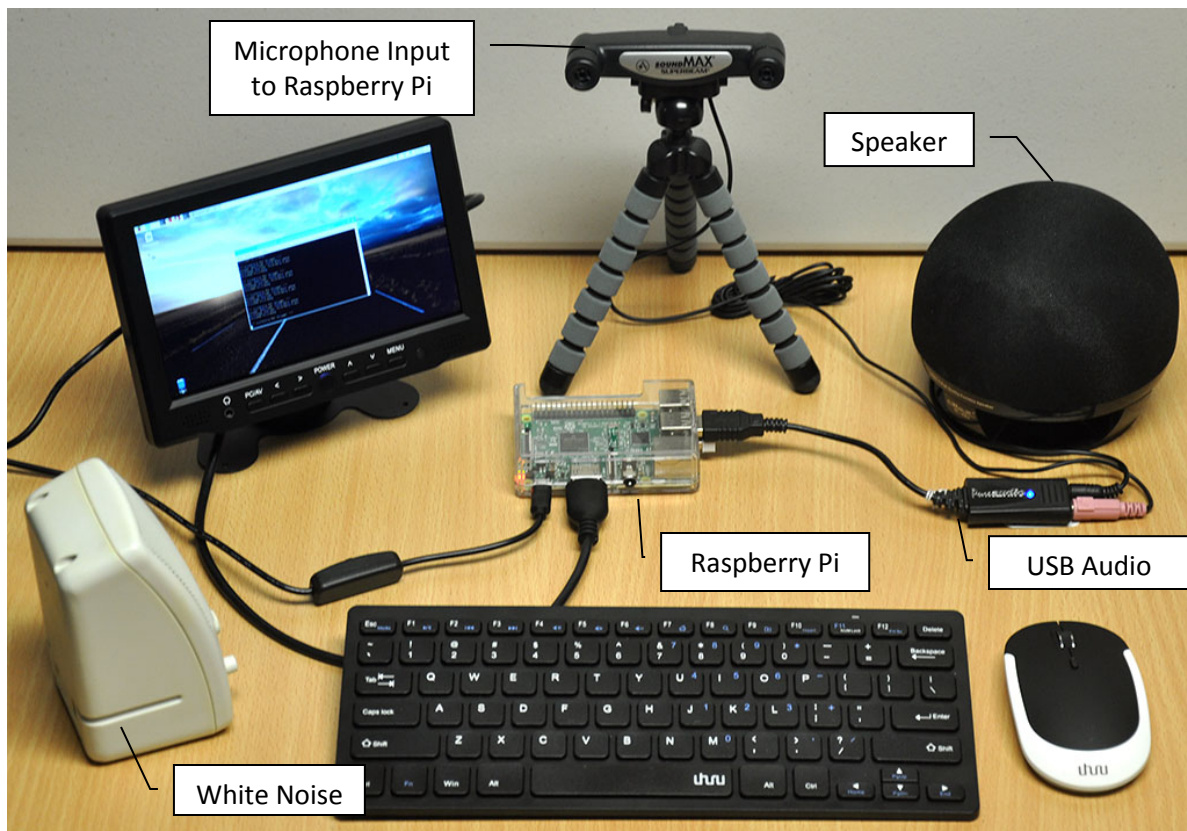
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This report documents the performance of Andrea's audio filters compared to the Intel Speech Enabling Developer Kit, which consists of an 8 microphone circular array attached to a Raspberry Pi.

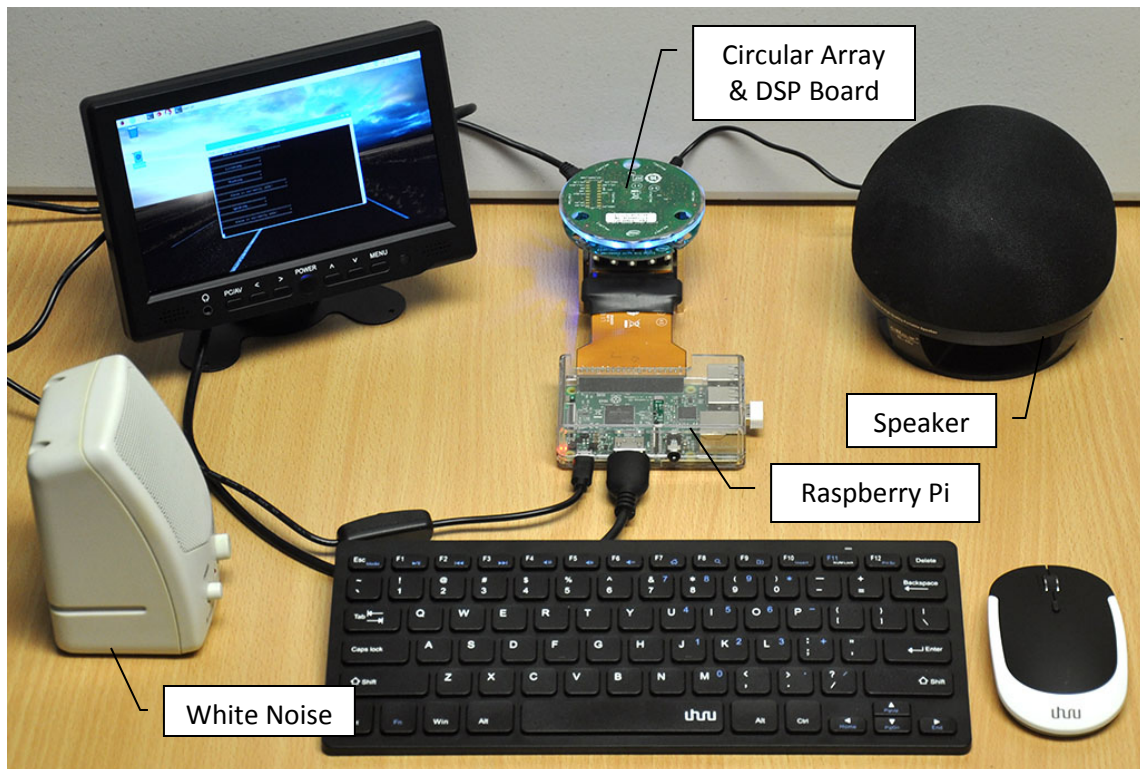
Andrea Setup:

- Andrea's audio filters are running on a Raspberry Pi.
- Microphone is an Array 2s connected to a Andrea PureAudio USB device, which is connected to the Raspberry Pi.
- The following audio filters are use:
 - Beam forming (DSDA)
 - Noise reduction (NR)
 - Far-Field Enhancements (FFE), which compensates for weak audio signals when speaking from long distances.



Intel Setup:

- Intel's audio filters are running on a DSP board that is attached to the circular array.
- The circular array has 8 microphones, 6 around the edge and 2 in the middle.
- It is reported that it has algorithms for beam forming, noise reduction and acoustic echo cancellation. It is assumed that these three algorithms are running for these tests. The device has 12 LEDs, but they do not change, so it is unknown where the beam is pointing. The device also has 5 push buttons, but they do not appear to do anything.



Test Description:

- The trigger is spoken for each device - "Hello blue genie" for the Andrea setup and "Alexa" for the Intel setup.
- The distance between the spoken trigger and the test device varies from 2 feet (0.6 meters) to 18 feet (5.5 meters).
- White noise is played at an angle of 45 degrees from a distance of 18 inches (0.046 meters)
- Tests consists of speaking the trigger 10 times at each distance for each noise level. To get a success score the trigger has to be recognized.
- Tests performed with five different noise levels:

- Quiet room with no additional noise
- 55dB of white noise
- 60dB of white noise
- 65dB of white noise
- 70dB of white noise
- For each distance and noise level, the Andrea setup is tested with the following filter combinations:
 - No Filters – all audio processing is turned off allowing the raw audio from the microphone to be passed to the trigger detection. This simulates the results that would be obtained by using a standard microphone.
 - Beam Forming, Noise Reduction and Far-Field Enhancements.

Results:

The following graphs show the percent of successful trigger detections under the stated noise conditions from 2 feet (0.6 meters), 6 feet (1.8 meters), 10 feet (3.0 meters), 14 feet (4.3 meters) and 18 feet (5.5 meters).

