



# Motivation

- ❖ “Chapping lips without any sound look really weird”  
– chromecast audio user
- ❖ “Google, you should be better than this”  
– another chromecast audio user
- ❖ Existing systems like Bose SoundTouch or Sonos Play are either costly or not available in the Indian Market.
- ❖ Do not want to plug in speakers wires intro every other device.
- ❖ Speaker wires are fragile (even getting them soldered back costs INR 100)
- ❖ We need a device which can stream PC audio in realtime!

# *Rāgam*: Project Proposal

under the guidance of  
Prof. Kavi Arya

Bharat Reddy, Diptesh Kanodia, and Vinod Saini

CS684: Embedded Systems Project

CSE Department, IIT Bombay





# Roadmap

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- ❖ Motivation
- ❖ Prior Work
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- ❖ Hardware Requirements
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- ❖ Feasibility
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# Abstract

“Make Wired speakers great again!”

- ❖ Device to be able to receive music from PC (mandatorily) / Mobile Devices (optionally), and transmit the audio to speakers connected to it.
- ❖ Our motto – “Make Wired speakers great again!”
- ❖ We aim to route low bit rate music to the device initially.
- ❖ Our device should be able to route music of any quality to a standard 3.5mm audio jack later.
- ❖ Additionally, we aim to stream the music over FM Radio frequency.
- ❖ Finally, we would like the product to be stripped off any extra components, and become portable / cost – effective for the Indian market.



# Prior Work

- ❖ Bose SoundTouch 10 (USD 200!<sup>1</sup> / INR 18,602<sup>1</sup>. Costly, app does not support PC setup)
- ❖ Sonos SoundPlay:1 (INR 26,999!<sup>2</sup> Costly)
- ❖ Gramofon (60 EUR<sup>3</sup>, not available in India)
- ❖ Trippy<sup>4</sup> (shelved)

<sup>1</sup>[https://www.bose.com/en\\_us/products/speakers/wireless\\_speakers/soundtouch-10-wireless-system.html](https://www.bose.com/en_us/products/speakers/wireless_speakers/soundtouch-10-wireless-system.html)

<sup>2</sup><http://www.ebay.in/itm/Bose-Soundtouch-10-/272349437205>

<sup>3</sup><https://gramofon.com/>

<sup>4</sup><http://make.witworks.com/preorder/trippy>

# Problem Statement



- ❖ To develop a device which can stream audio from PC / Mobile to speakers.
- ❖ The device should make use of Wi-Fi wireless protocol to receive data.
- ❖ It should be able to stream higher bitrate audio (usually 320 Kbps).
- ❖ The device should be able to perform without any lags whatsoever.
- ❖ Additionally, the device can be made to transmit music over FM frequency thus making it accessible over a large range (across rooms).

# Hardware Requirements



- ❖ Raspberry Pi 3/ Arduino (primarily testing)
- ❖ Wireless router (primarily testing)
- ❖ PC / Laptop / Mobile Device (programming and testing)
- ❖ USB sound card (good quality)
- ❖ FM Transmitter
- ❖ Wires to connect (Power, LAN, Audio cable etc.)
- ❖ Power Sockets with Electric Supply!

# Software Requirements



- ❖ Python / CPP
- ❖ RaspbianOS / JessieOS / Energia



# Implementation

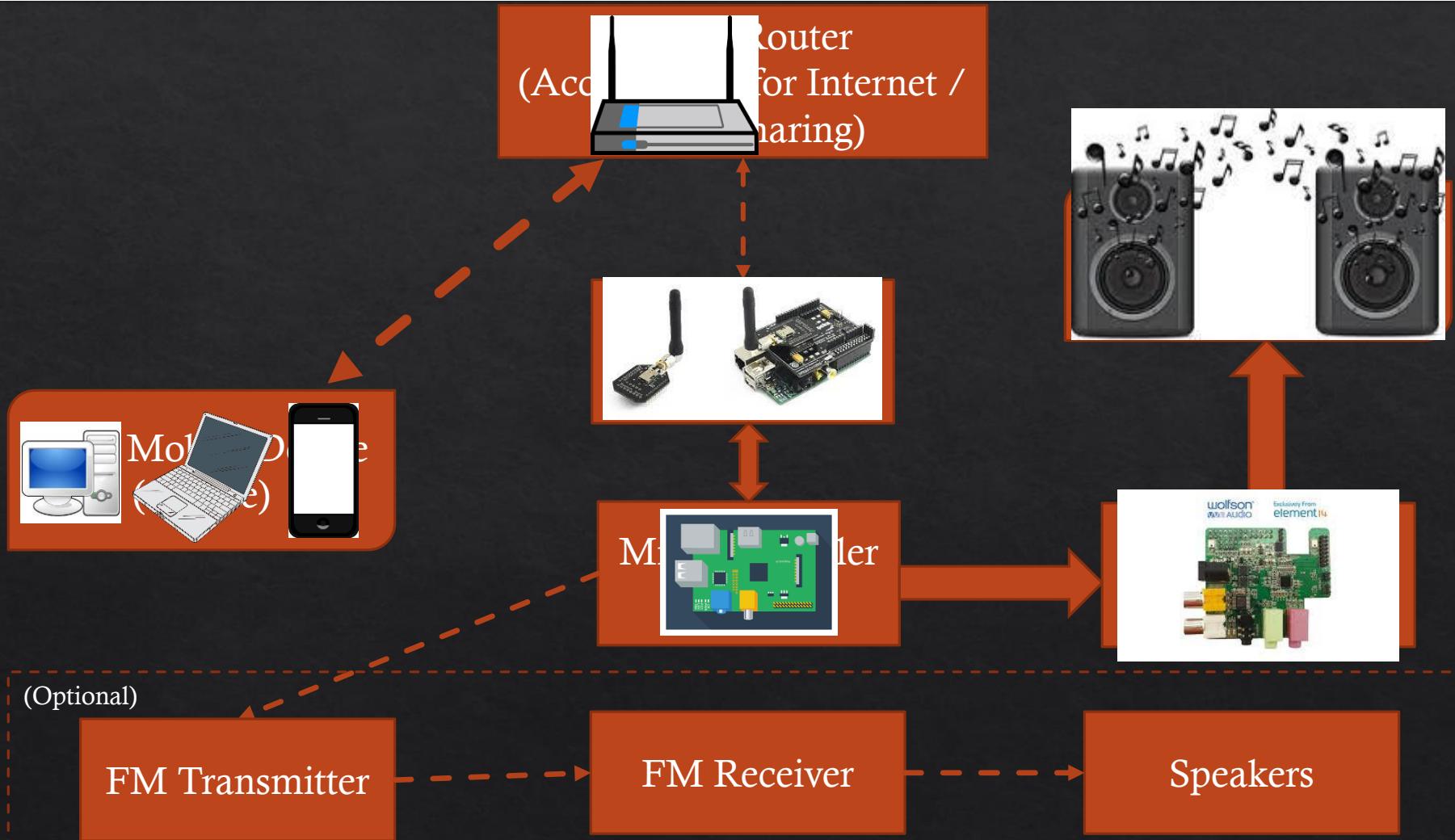


Image Sources: OpenClipart, ClipartKid, Google Image Search



# Feasibility

- ❖ It would be feasible, Yes!
- ❖ But, there are some pitfalls i.e. we might experience temporal lag in the audio, which we would like to remove.
- ❖ The reasons for such lag could be constrained bandwidth, high bitrate, connectivity issues etc.
- ❖ We would like to test our device in various scenarios and ample test cases for it to be a viable and cost-effective product.



# Testing

- ❖ We would like to test our device based on these cases:
  - ❖ PC -> Device -> Speakers (any audio)
  - ❖ PC -> Device -> Speakers (low bitrate)
  - ❖ PC -> Device -> Speakers (high bitrate)
  - ❖ PC -> Device -> Speakers (FLAC audio)
  - ❖ Optionally, PC -> Device -> FM Transmitter -> FM Receiver -> Speakers (the above cases)

# Work allocation & Timeline



- ❖ Work Allocation
  - ❖ Bharat:
    - ❖ Receiving data on the Microcontroller.
    - ❖ Downsampling (if required).
  - ❖ Diptesh and Vinod
    - ❖ Procurement.
    - ❖ Setup (configuring WiFi module on RPi to connect to local WiFi).
    - ❖ Sending data to Microcontroller.
- ❖ Timeline:
  - ❖ Procurement and Setup - 1 Week
  - ❖ Microcontroller setup – 2 weeks
  - ❖ Audio Streaming API – 1 Week
  - ❖ Quality Control and Testing – 2 Weeks (Upto End Semester)
  - ❖ Application Development (Serious Time Constraint) – 2 Weeks



# References

- ❖ <http://make.witworks.com/preorder/trippy> [5th September 2016]
- ❖ <https://gramofon.com/> [15th September 2016]
- ❖ [https://www.bose.com/en\\_us/products/speakers/wireless\\_speakers/soundtouch-10-wireless-system.html](https://www.bose.com/en_us/products/speakers/wireless_speakers/soundtouch-10-wireless-system.html) [15th September 2016]
- ❖ <http://www.ebay.in/itm/Bose-Soundtouch-10-/272349437205>
- ❖ Google Images (Non – Copyright images like Clipart used from OpenClipart, and ClipartPanda)

Thank you! 😊  
Questions ?

