

# **Intelligent Dancing Hexapod Group G13**

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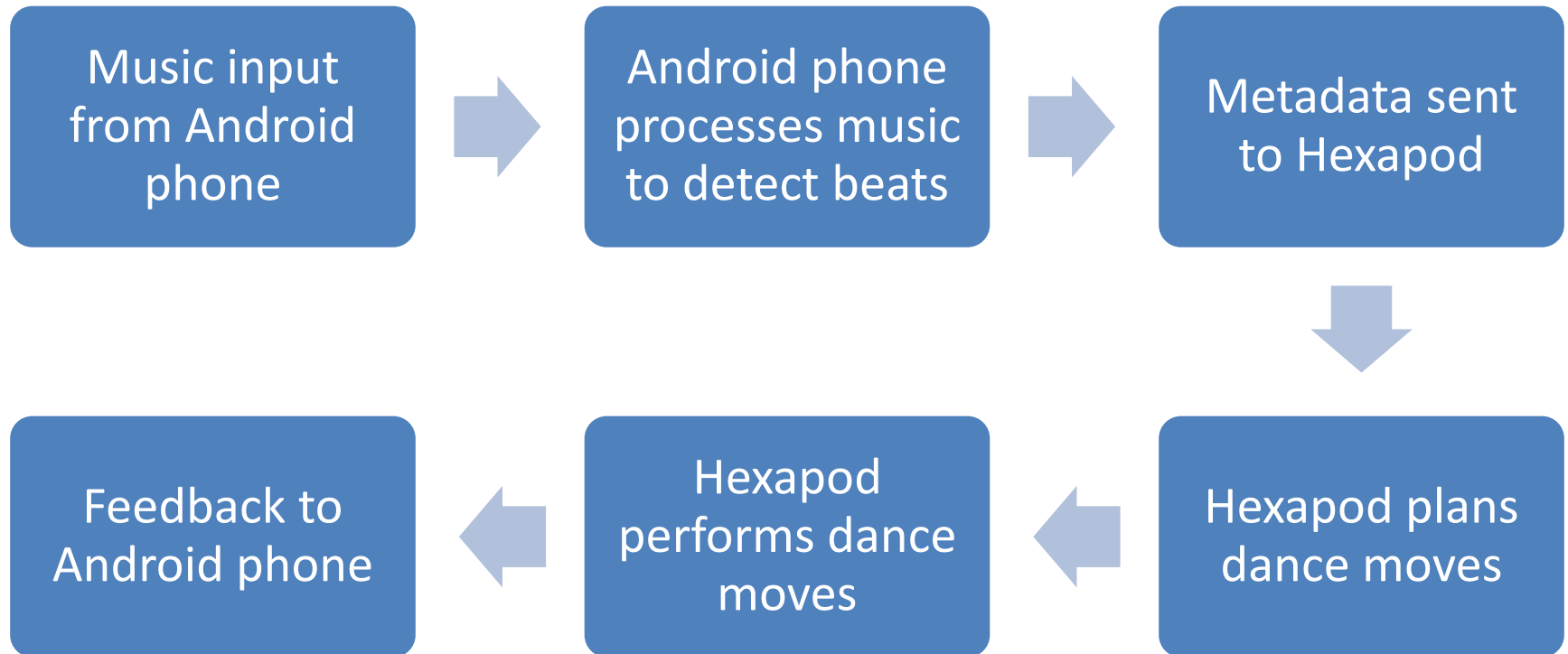
# Introduction

- An intelligent dancing hexapod which dances on the beats of the audio input.
- The user has to play any song on his Android Based Phone, and the hexapod will dance according to the song played.
- The Android phone will communicate wirelessly with the hexapod.

# Subparts

- Sound processing- Beat sequence detection
- Designing and Implementing different gaits(dance moves) for the hexapod.
- Developing an android app for implementation of the sound processing algorithms developed.
- Setting up wireless communication between the android phone and the hexapod.

# Flowchart



# Functional Requirements

- The hexapod should perform dance -moves after reading the metadata sent to it. (Liveness)
- It should have at least 5 aesthetic moves to choose from.
- Delay between the dance step and the corresponding beat must be low so that it is not apparent visually (Timeliness).
- A UI through which the user will interact with the hexapod. The UI will allow all types of functions such as play/pause/change song.
- The hexapod should not lose balance or cause damage to itself due to excess stress/strain (Safety).

# Non-Functional Requirements

- The android phone must communicate wirelessly with the hexapod.
- Hexapod movement should be fast and smooth. (This depends on the provided hardware)
- Hexapod must not leave the arena.
- The user must be alerted in case of failure

# Stages of Development

- **Sound Processing algorithm development:**
- **Android app development:**
- **Hexapod**
- **Integrating the parts**

# Sound Processing algorithm development

- Testing beat detection algorithm on a computer
- Finding periodic patterns in the beats.
- Test on various test inputs in increasing order of complexity



# **Android app development:**

- Reading audio input
- Implementing beat detection on android
- Wireless connectivity with the Hexapod  
(creating a hotspot)

# Hexapod:

- getting basic hexapod gaits working
- Defining various dance moves and breaking down dance moves into dance steps.
- Scheduling algorithm for choosing dance moves depending on sample beat sequence inputs
- Testing of zigbee module for wireless communication

# Integrating the parts:

- Designing a data structure for metadata and protocol for communication
- Get the hexapod to accept inputs from the Android application.
- Implementing a feedback loop for the android phone and hexapod system

# Risks

- Achieving Real Time sound analysis
  - ***Reason***: Android device is not able to handle the Sound processing load.
  - ***Workaround***: Instead of a full realtime system, we can do some pre-processing of the input.
- Beats not getting detected in music
  - Try to design a technique to modify the input audio to make it suitable for beat detection.  
Example: eliminating non-percussion audio

# Risks

- Forcing hexapod to do what it cant
  - Initially, we can simulate the moves using flashing leds or by displaying messages before making the bot perform them.
- Music is faster than the bot could dance to
  - Moves would be divided into different steps

# Test Data in increasing order of complexity

- Audio with only single periodic beat
- Audio having single beat but with variable periods
- Audio with multiple beats with different periods with same intensities
- Audio with multiple beats with different periods with different intensities