Team D3 - WoodWindMania

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Add your 12 slides after this slide… [remember, 12 min talk + 3 min Q/A]

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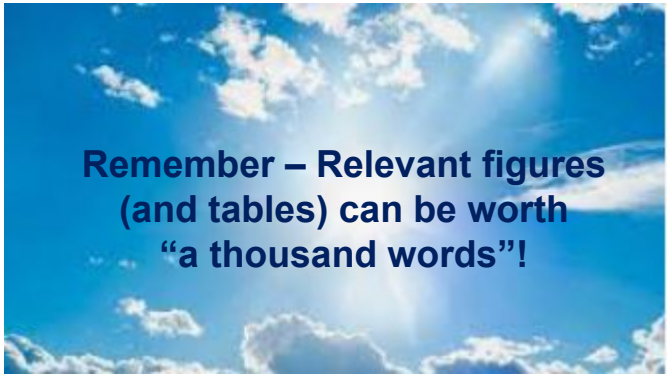
Make sure to cover
(refer to the Proposal Presentation Guidance):

- Use Case
- Use-Case Requirements, especially Quantitative
- Technical Challenges
- Solution Approach
- Testing, Verification and Metrics
- Tasks and Division of Labor
- Schedule



Consider that this slide already works as a introduction slide so use your first slide wisely

Use Case

- **Problem**: Learning woodwind instruments has a high cost associated with it and may not be practical to do in most environments
    - Lessons plus Instrument, which can cost around $1000
    - Not beginner friendly
- **Solution**: A digital woodwind learning tool that allows users to learn fingerings on a realistic woodwind controller, in this case a flute
- **Areas**: Hardware Design & Software Systems

WoodWindmania

musical learning starts here

Requirements

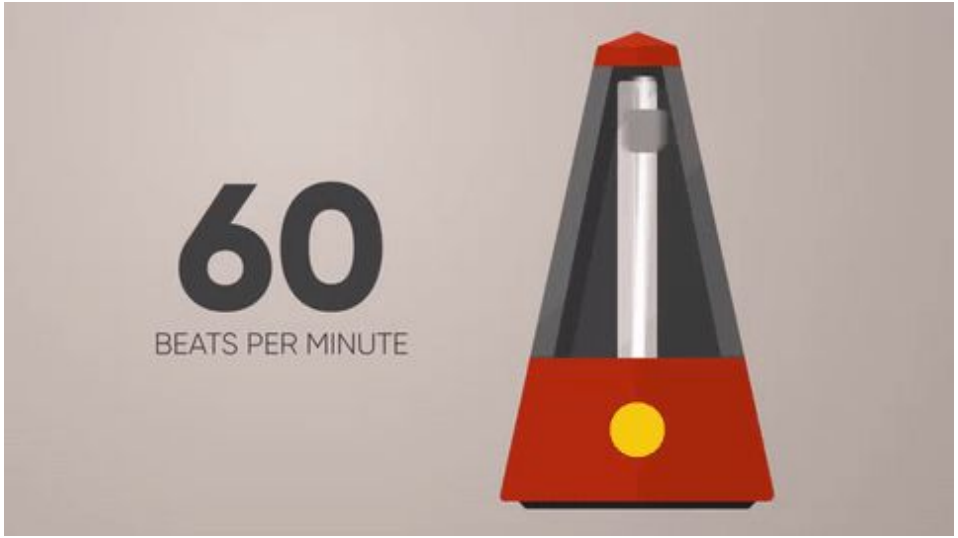
- **User Experience**
  - Comparison to real instrument
    - Weight (1.3lbs)
      - 1” PVC pipe: .7lbs
      - Arduino Nano: .01lbs
      - 9V battery: 0.1lbs
    - Length (26”) x 1”
      - Arduino Nano: .7”
      - 9V battery: 1” width
    - User satisfaction: 4/5
  - Beginner friendly
    - Intuitive web application
  - Portability
    - Wireless

Requirements

- **Accuracy**
  - Note feedback (>= 90%)
    - Absolute Pitch (from human ear)
  - Orientation feedback (>= 90%)
    - Could notice a += 10º change in angle
  - Octave feedback (>= 75%)
    - ~2000Hz range in flute, with octaves ~500Hz apart

Requirements

- **Speed**
  - Time between user input and feedback (<= 1s)
  - Turnaround time between notes (<= 1s)



Challenges

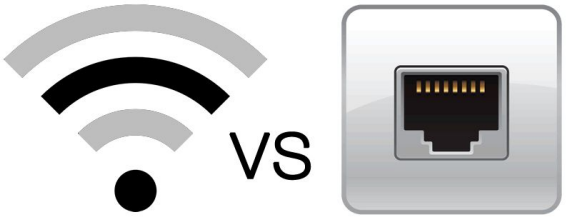
- **Speed**
  - Bluetooth latency (Sensors -> Arduino -> RPi)
  - Wireless communication latency (Wifi)
- **Accuracy**
  - Sensors
    - Buttons on device
    - Microphone for detecting user breath
    - Gyroscope for controller position
  - Wireless Communication (Dropped Packets)
    - Bluetooth communication
    - Wifi communication

Challenges

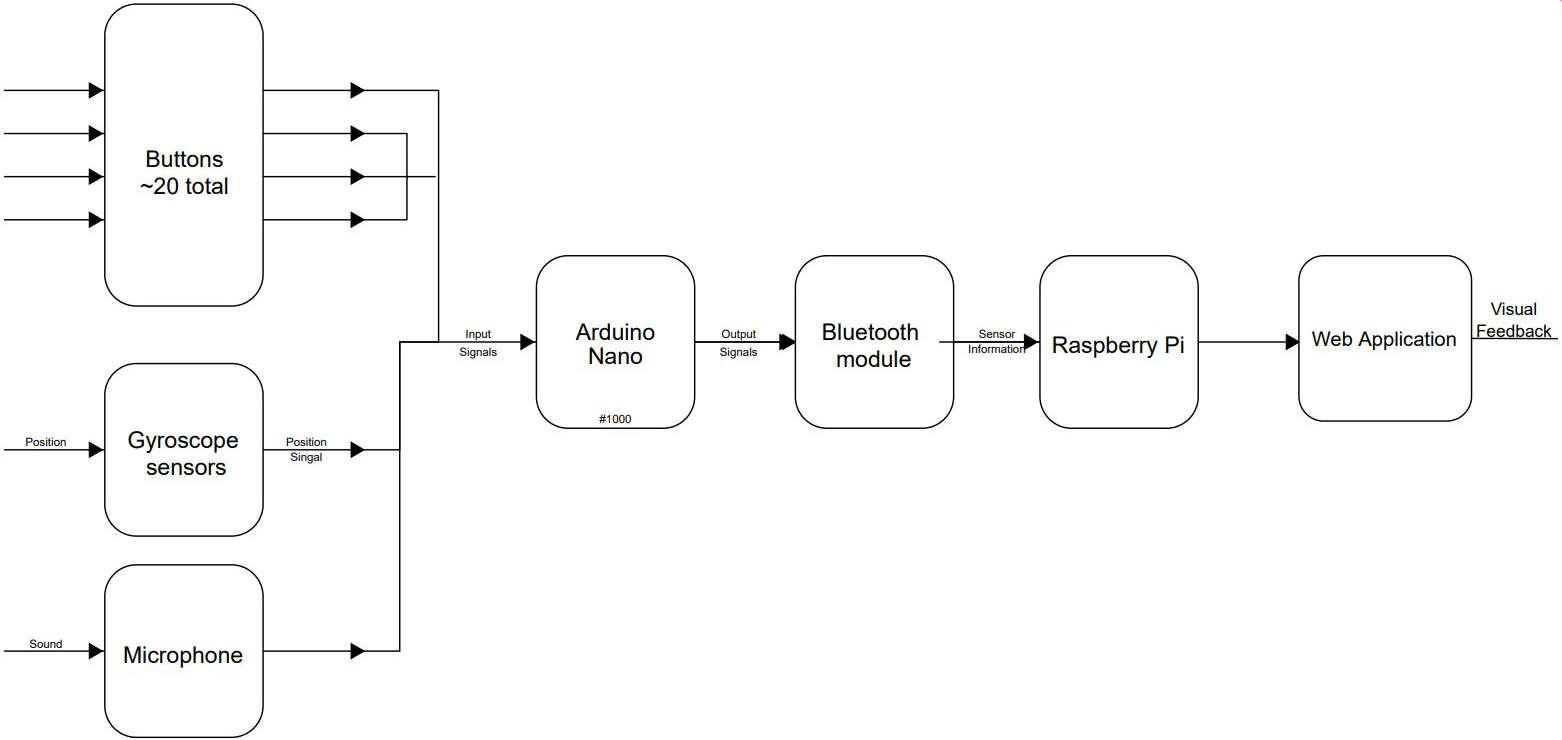
- **User Experience**
  - Weight
  - Dimensions
- **Battery Life**
  - Wireless communication + arduino + ~20 buttons + microphone + gyroscope
  - Battery should last 3 hours of practice

Challenge Mitigations

- **Speed**
  - Use wired communication
  - Play note off of Pi instead of web app
- **Accuracy**
  - Test variety of sensors to determine most accurate
- **User Experience**
  - Use wired communication and remove components from inside device
- **Battery Life**
  - Use wired communication



Solution


Buttons
~20 total
Position
Gyroscope
sensors
Position
Singal
Sound
Microphone
Input
Signals
Arduino
Nano
#1000
Output
Signals
Bluetooth
module
Sensor
Information
Raspberry Pi
Web Application
Visual
Feedback

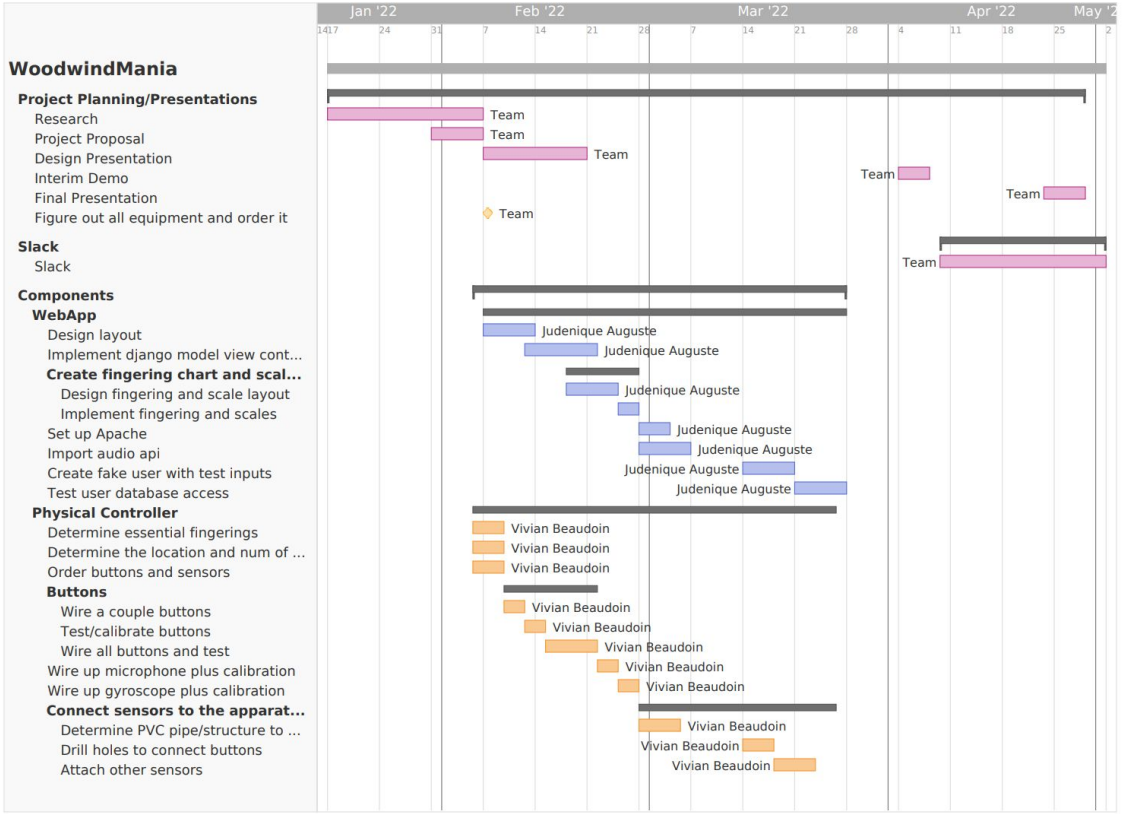
Testing, Verification, and Metrics

Requirement	Testing Strategy	Metric
Working Sensors	Test feedback of accurate and inaccurate note fingerings	>= 90% accuracy
Tilt Detection	Test feedback in a variety of different positions	>= 90% accuracy
Breath Detection	Compare note played on real flute to sensor reading	>= 75% accuracy
Visual Feedback	Record latency between user input and feedback	Feedback in <= 1s
Comparison to real instrument	Record measurements, user survey	1.2-1.3 lbs, ±0.5”, 80% user satisfaction

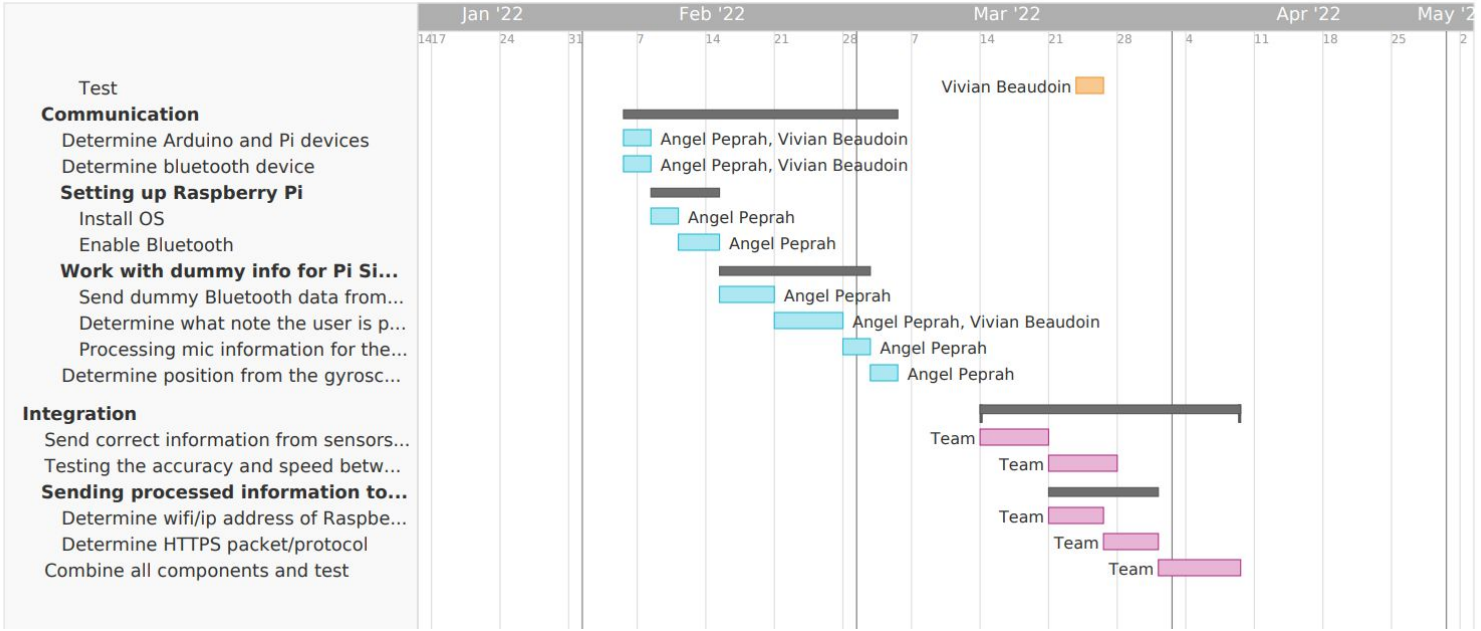
Tasks/Division of labor

Vivian	Angel	Judenique
Physical Component ● Research best sensors ● Test and calibrate sensors with Arduino ● Assemble apparatus	Communication ● Research best Arduino, bluetooth, and RPi models ● Send sensor packet from Arduino to RPi ● Send processed info to web app	User Interface ● Design web application layout and modes ● Create scales and fingerings for instruments ● Giving feedback based on user input

Schedule


Jan '22
Feb '22
Mar '22
Apr '22
May '2
14 17 24 31 7 14 21 28 7 14 21 28 4 11 18 25 2
WoodwindMania
Project Planning/Presentations
Research
Project Proposal
Design Presentation
Interim Demo
Final Presentation
Figure out all equipment and order it
Slack
Slack
Components
WebApp
Design layout
Implement django model view cont...
Create fingering chart and scal...
Design fingering and scale layout
Implement fingering and scales
Set up Apache
Import audio api
Create fake user with test inputs
Test user database access
Physical Controller
Determine essential fingerings
Determine the location and num of ...
Order buttons and sensors
Buttons
Wire a couple buttons
Test/calibrate buttons
Wire all buttons and test
Wire up microphone plus calibration
Wire up gyroscope plus calibration
Connect sensors to the apparat...
Determine PVC pipe/structure to ...
Drill holes to connect buttons
Attach other sensors
Team
Judenique Auguste
Vivian Beaudoin

Schedule


Jan '22
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14 17 24 31 7 14 21 28 7 14 21 28 4 11 18 25 2
Test
Communication
Determine Arduino and Pi devices
Determine bluetooth device
Setting up Raspberry Pi
Install OS
Enable Bluetooth
Work with dummy info for Pi Si...
Send dummy Bluetooth data from...
Determine what note the user is p...
Processing mic information for the...
Determine position from the gyrosc...
Integration
Send correct information from sensors...
Testing the accuracy and speed betw...
Sending processed information to...
Determine wifi/ip address of Raspbe...
Determine HTTPS packet/protocol
Combine all components and test
Vivian Beaudoin
Angel Peprah, Vivian Beaudoin
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Angel Peprah
Angel Peprah
Angel Peprah, Vivian Beaudoin
Angel Peprah
Angel Peprah
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