

MAES:TRO: A Practice System to Track, Record, and Observe for Novice Orchestral Conductors

CHI 2014 Student Design Competition:
Supplementary Material

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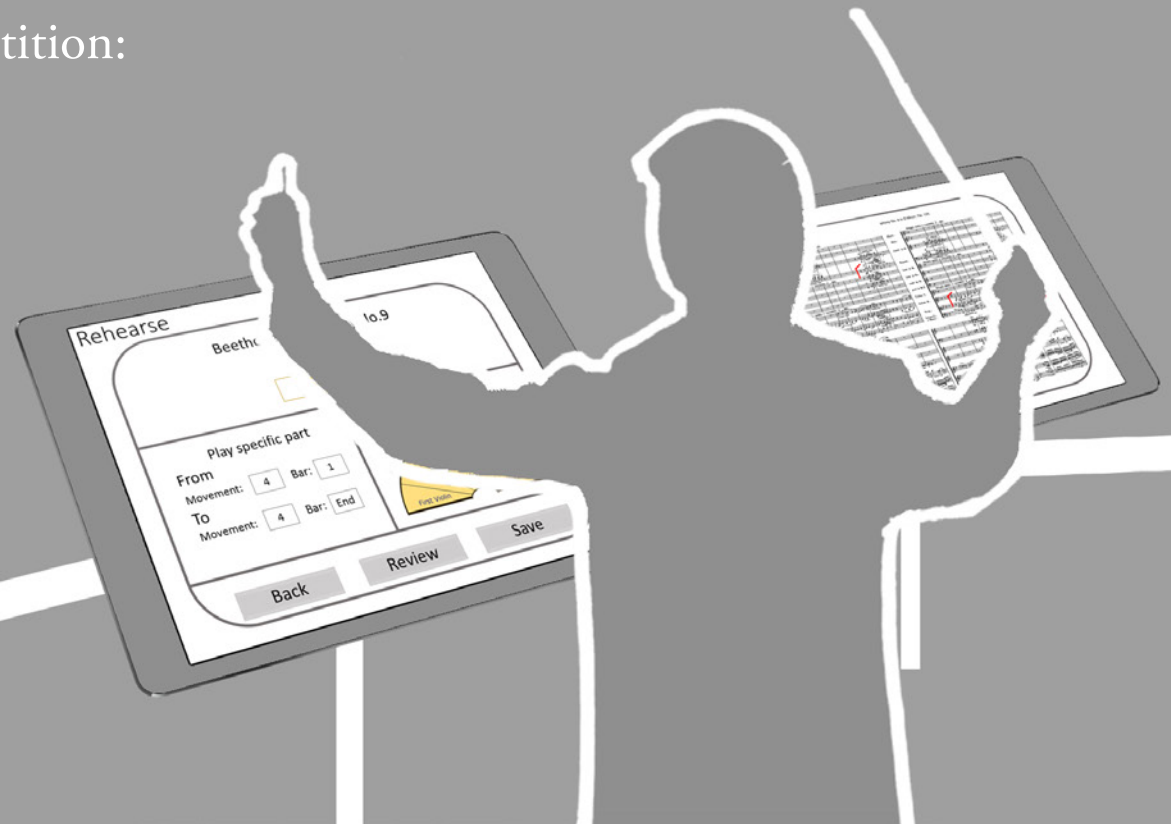


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Understanding the challenge



Affinity diagramming to understand the space.

Inner Body HEALTH

Immigrants

- financial management
- seeing/chatting with family members
- touching/feeling them if possible
- educating their children

Uninsured population (healthcare)

- medical record management
- health status info.
- financing solutions.

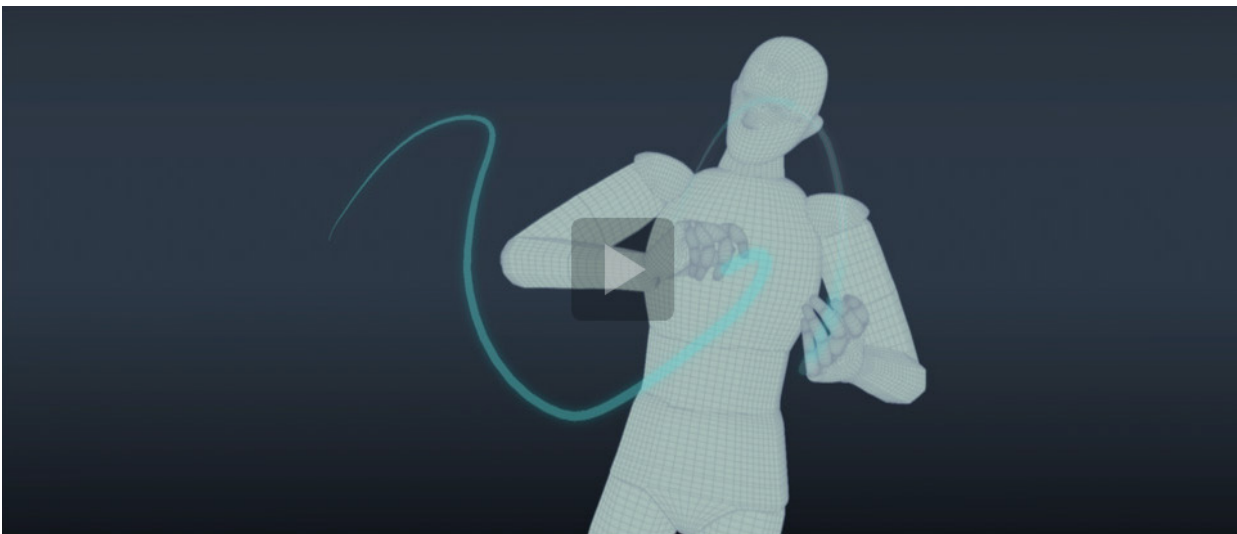
Truck Driver Salvation (people who sit for a long time)

- Move their bodies
- correct posture
- scheduling stop points during the trip
- (less time spent on PC screen)

What is conducting?

Conducting is defined in the Oxford Dictionary of Music as “the art or method of controlling a choir, a band, an orchestra, or an operatic performance by means of gestures, which involve the beating of time, ensuring correct entries, and the ‘shaping’ of individual phrasing” [2,3] A conductor’s goal is to bring a written score to life through body motion [4]. A conductor is like a CEO; he interprets the music, and organizes the orchestra to play in his own way.

Alan Gilbert, music director of the New York Philharmonic, demonstrates and discusses the role of a conductor for the New York Times. Click the image to view.



Who are novice conductors?

By “novice conductors”, we refer to people in their first four years of studying conducting. Novice conductors need to practice and learn basic conducting techniques as they gradually develop their personal style.

How do novice conductors practice?

Currently, novice conductors practice either with a live orchestra, or practice alone. During the solo-practice:

- Practice in front of a mirror.
- Video recording the practice for later review.
- Sometimes, they would conduct with visual aid of an ensemble, for example, conduct to teddy bears and hippos.



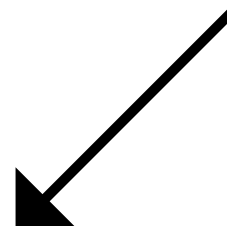
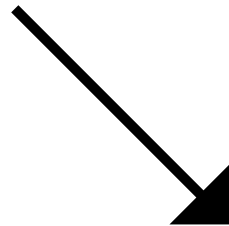
The Opportunity

Physical space

- Space/time constraints.
- Size of music program/budget at school.

Conducting student

- Scheduling with student orchestra
- Solo practice not effective



OPPORTUNITY



Student orchestra

- Scheduling
- Student talent/level learned

Primary Research

Interview with Conductors

“When conducting you produce sound by using your entire body. Your body is the instrument to create sounds and music.” (Christian, 2013)

“The best conductors can conduct just using their breath and facial expressions alone.” (Christian, 2013)

“When I started to learn conducting, I would place Teddy bears and Hippos in front of me and try to conduct to them.” (Danko, 2013)

“Eye contact is used to promote a sense of unity and gain attention of a certain person. Arms and hands set the tempo and the volume of a sections The best conductors can conduct just using their breath and facial expressions without using your arms.” (Kevin, 2013)

A group of four students are gathered around a small, round wooden table in a modern, brightly lit lounge. A young man with light brown hair, wearing a dark blue sweater, is leaning forward, looking at a laptop. A young woman with dark hair, wearing a dark blue top and a light green scarf, is also leaning forward, looking at the laptop. A young man with dark hair and glasses, wearing a dark blue sweater, is standing and leaning over the table, looking at the laptop. A young woman with dark hair, wearing a light blue cardigan, is sitting at the table, looking at the laptop. The laptop is a silver Apple MacBook. A white disposable coffee cup and a black smartphone are on the table. The background shows a hallway with a red exit sign and a speaker on the wall.

“For beginner conductors, practicing skills and techniques is essential.”
(Danko, 2013)

Primary Research

Interview with a Professor of Music Informatics

The goal is to learn about current musical accompaniment systems, and whether or not incorporating a responsive virtual orchestra is realistic.

“It is feasible to capture some of the gestures and sync the speed of the music with them.”

“It is not necessary to interpret specific gestures of a conductor; it is better to leave it to the conductor him/herself to interpret and evaluate.”

Interview with a Professor in Conducting

The goal is to learn about the main teaching methods and learning process of conducting.

“I listen to the music played by the orchestra and stop the conductor anytime when there’s an error.”

“The most important part of conducting is the ‘human-human interaction’, and the ‘chemistry’ that’s built between the conductor and musicians.”

“Technology can’t replace human interactions.”

Primary Research

Orchestral Class Observation

- Conductors face different directions and have direct eye contact to cue a section of the orchestra or individual musicians at specific parts of the music.
- Conductors need to flip the pages of their score during conducting.
- Conductors may speed up or slow down as he wish to interpret the music in his/her own way.
- Conductors use the number of movement and bar to refer to a specific section in the score.
- Conductors often stop the orchestra to give and receive verbal feedback and instruction.



Secondary Research

Literature Review

The Grammar of Conducting. A Comprehensive Guide to Baton Technique and Interpretation (3rd. ed.) [5]

Max Rudolf

From this book we learned about the basic beat patterns and mixed meters (where in one piece of music has multiple meters or the time signature changes frequently, and the beat patterns will change, eg., from a two beat pattern to a four beat pattern.) We also learned about how to correct hold baton in order to avoid confusion from the musicians' side. This helped us understand the meaning conductors want to deliver to musicians.

Learning and Teaching Conducting through Musical and Non-Musical Skills: An Evaluation of Orchestral Conducting Teaching Methods [6]

José Maurício Valle Brandão

We learned that to achieve a mastery of conducting one needs to possess both learned musical techniques including “Gestural techniques, Rehearsal techniques, Performance techniques, Conducting, Accompanying, and Coaching techniques Error detection”, and non-musical skills such as “Leadership, Charisma, Communication, Human Relationship.”

Developing conducting gestures for an expressive ensemble performance: A workshop for conductors. [7]
Dr. Hubert Toney, Jr.

From this research we learned some inhibitors and facilitators of expressive conducting gestures. It helped us to decide which gestures are obviously incorrect so the system can detect and point them out in the report.

Insights from Research

- 1 Visualizations of an orchestra can help the conductor allocate his attention to different sections of the orchestra instead of relying on his imagination alone.
- 2 A fixed installation can make it easier for the conductors to see themselves from different angles.
- 3 Conductors want to be in control of the music.

Design Inspiration

The Informatics Philharmonic – Christopher Raphael

The Informatics Philharmonic is “a computer-driven orchestra follows and learns from a soloist in real time” [8].

Conductors Jacket – Teresa Marrin Nakra

Conductors' Jacket is “a wearable device that measures physiological and gestural signal and uses musical software system to interpret these signals” [9].

Follow Me! – Seungju Han, Jung-Bae Kim, and James D.K. Kim

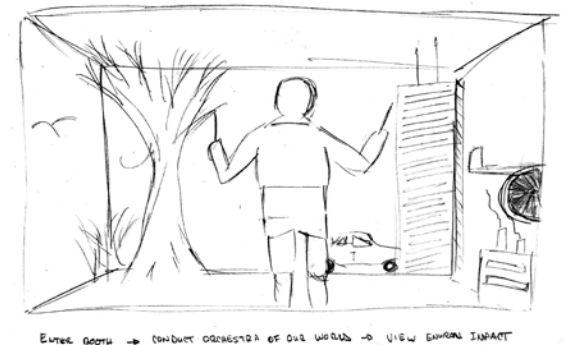
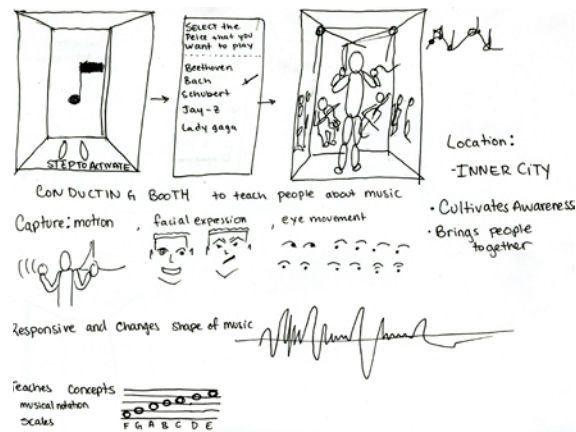
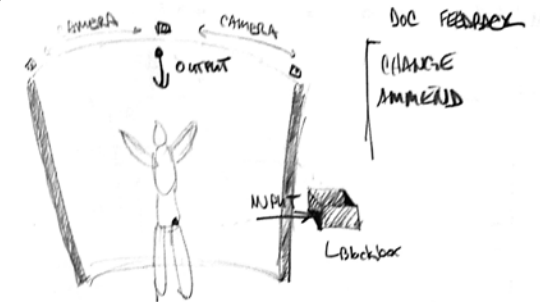
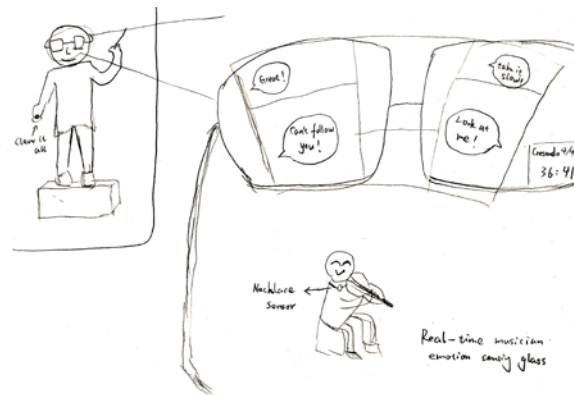
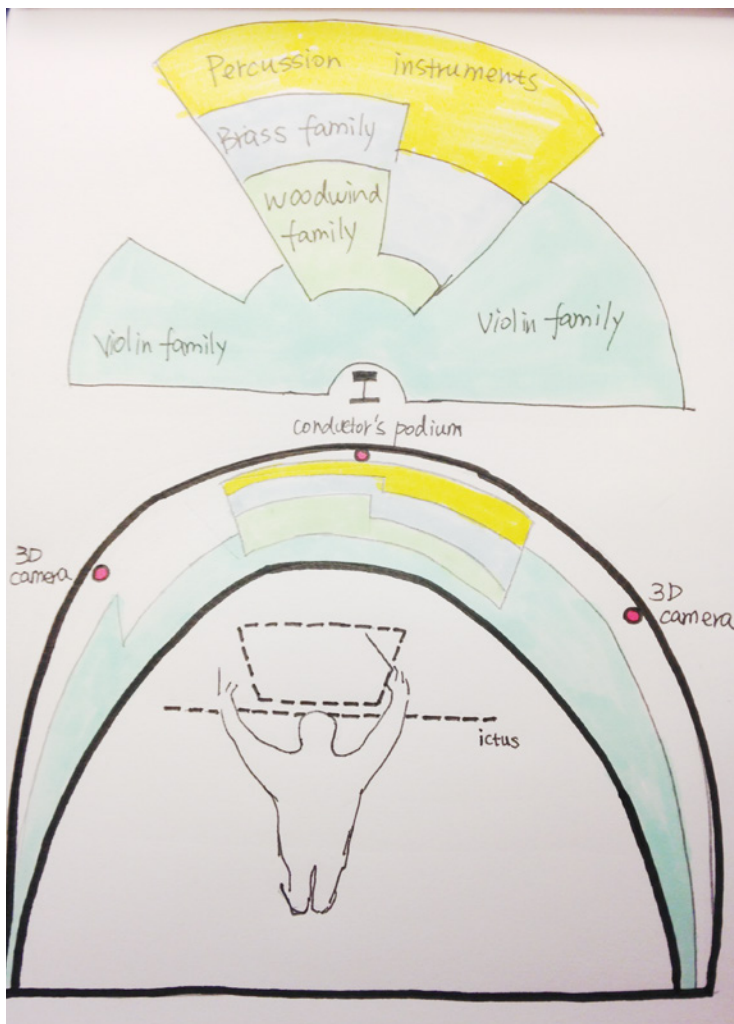
Follow-Me! is “a real-time continuous gesture recognition system” [10].

iSymphony – Lee, E., Karrer, T., Kiel, H., Wolf, M., Dedenbach, S., Borchers, J., and Grüll, I

“iSymphony is an interactive orchestral conducting system for digital audio and video that adaptively adjusts to the user's conducting style.” [11]

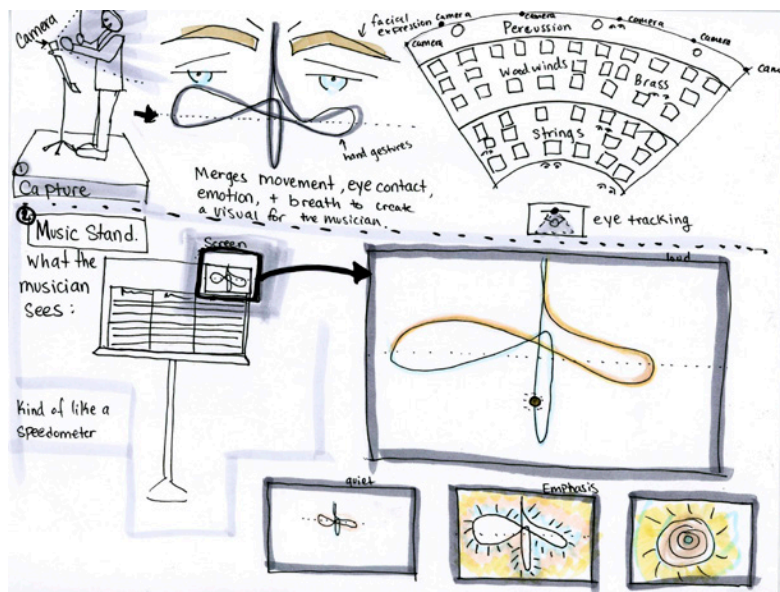
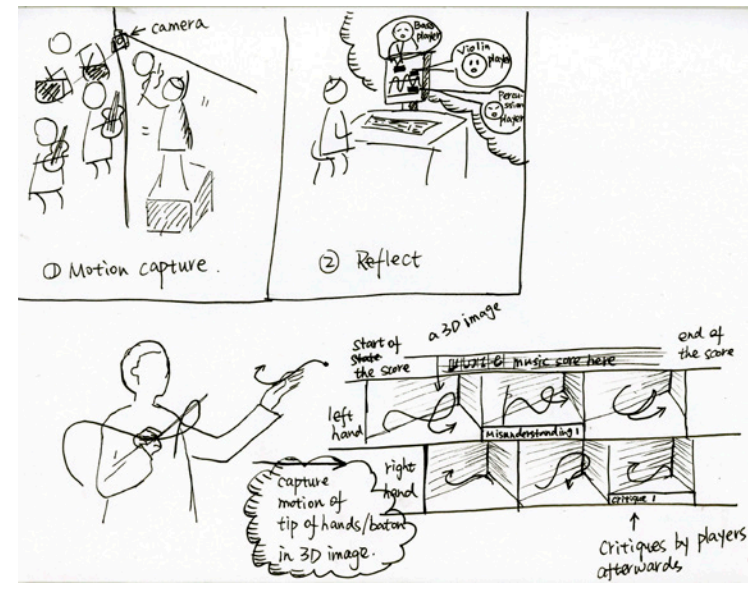
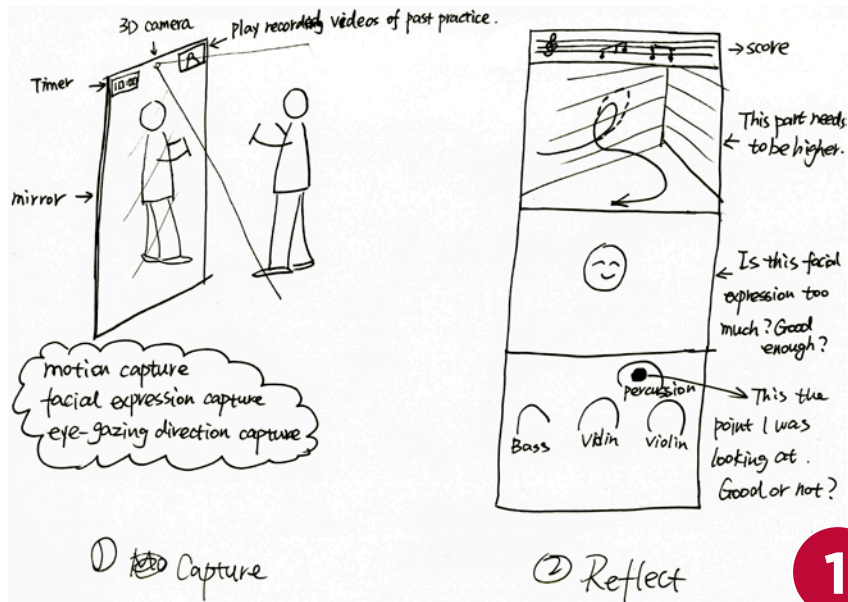
Early Ideation

Using these valuable insights and research, we sketched ideas and generated 10 concepts that could help conductors increase the effectiveness of solo practice.



Enter room → conduct orchestra of our world → view global impact

We select 3 of our concepts which constructed a system containing three phases: practice, perform and review before, during, and after performance.



1. The conductor practices in front of a mirror with a 3D camera installed to capture his body movement.
2. Musicians can see an animation of the conductor's hand gestures in real time on the music stand to avoid confusion.
3. After performance, the conductor returns to the application to receive critiques from musicians.

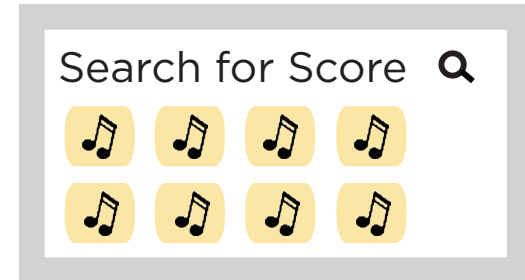
The MAES:TRO system



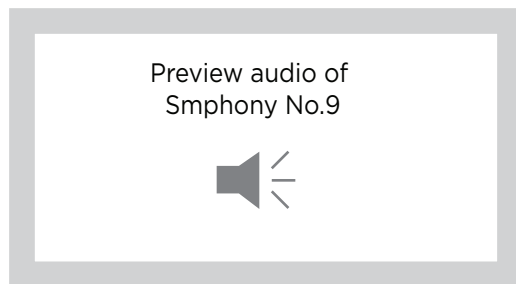
Sign in with your university ID. This allows the system to track and save your performances.



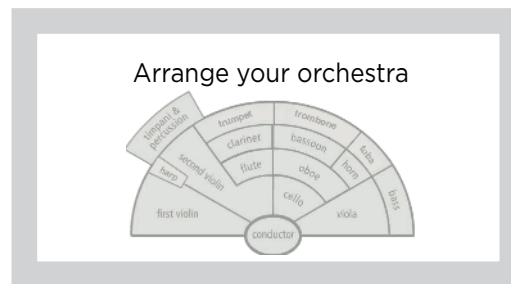
Select rehearse to begin practice.



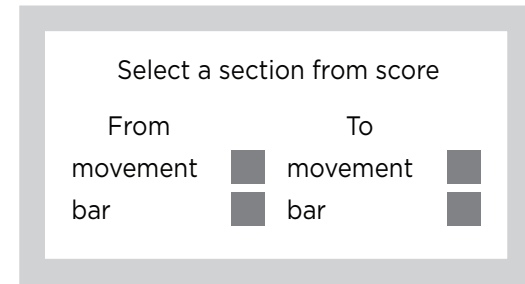
Find the score you wish to practice from a list of recently practiced scores or by searching.



Preview the score before moving on.

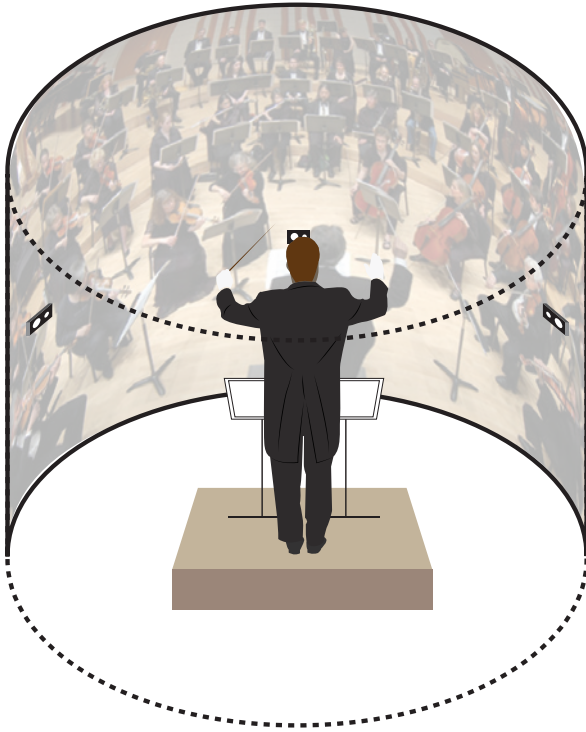


Adjust number and type of instrument in your orchestra.

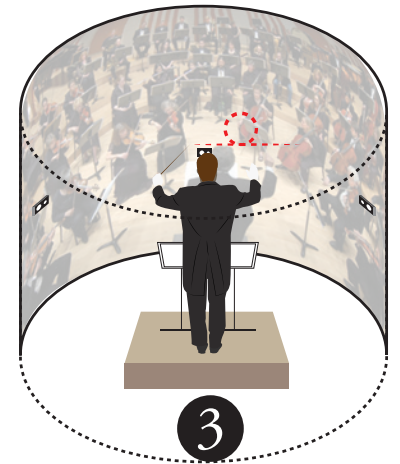
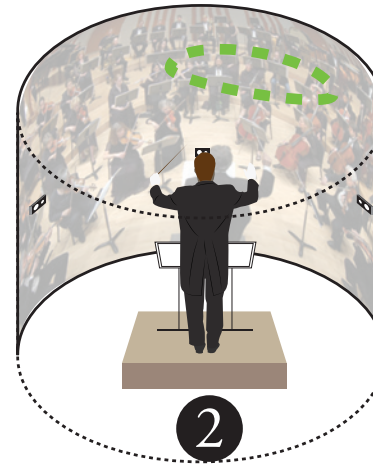
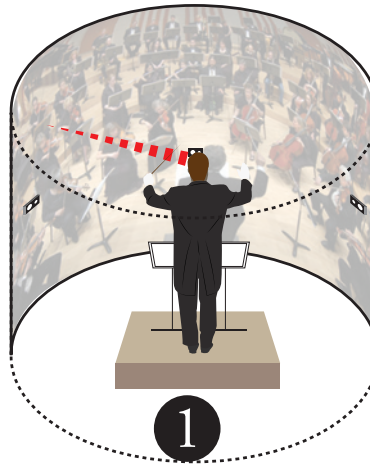


Select when to begin and end.

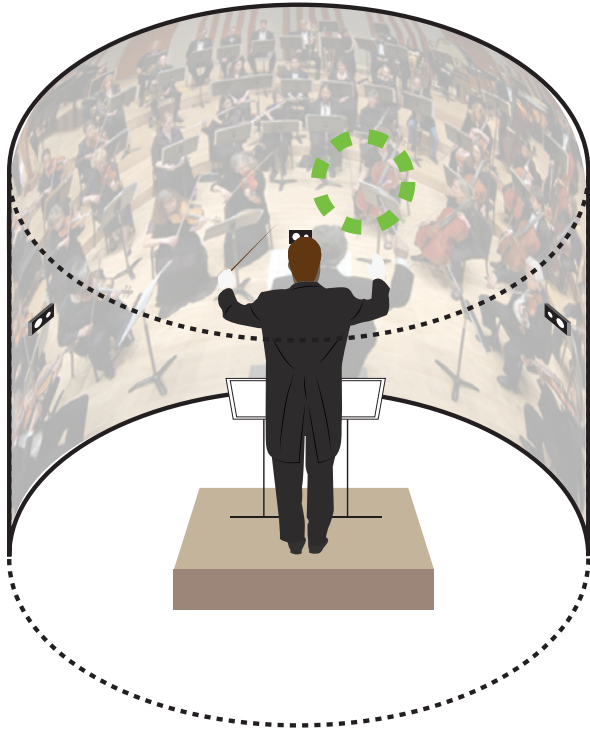




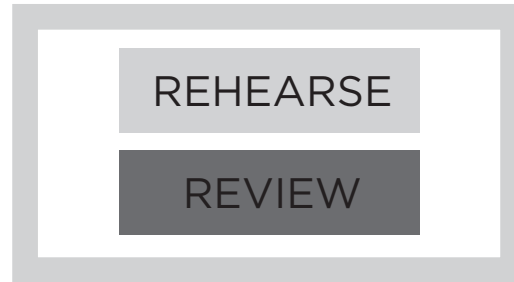
Begin to rehearse.



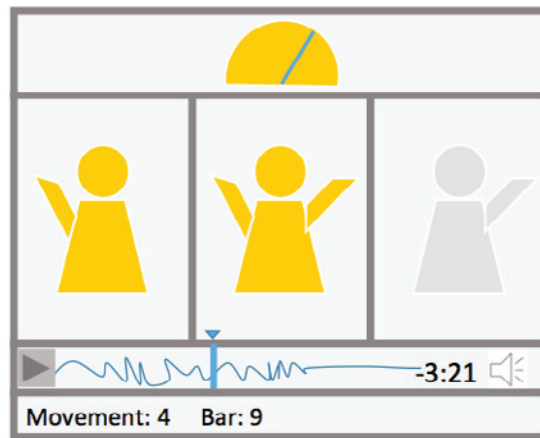
The system tracks your (1) body orientation, (2) eye gaze direction, and (3) wrist and arm movements. The beat, tempo and volume and instrumental emphasis of the music adapt to conductor's gestures.



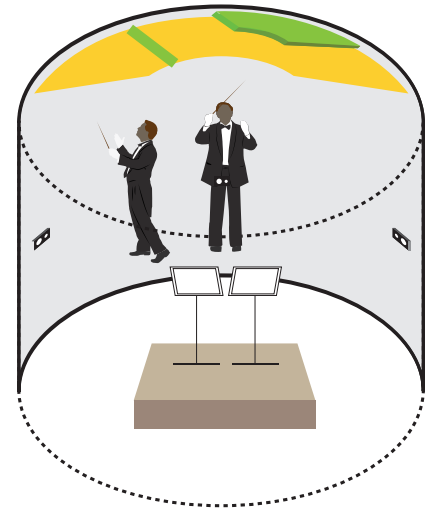
At any point, make the cut-off (stop) gesture to stop rehearsing and recording.



Select review to continue.



Selecting any view (in this case, front view and left view) and orientation indicator on control panel.

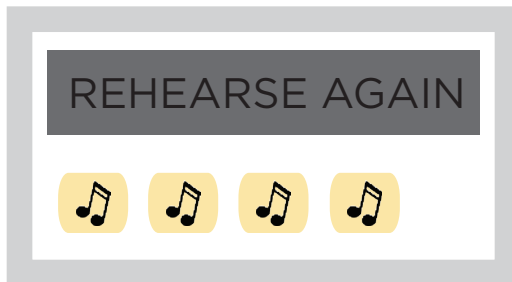


Corresponding videos of previous practice are projected on the screen. On the animated graphic, the green line and area indicate body orientation and eye-gaze direction at any given point of the recording.



During review, conductors can mark cues at a specific location and make short notes on the electronic score.

The system will find inconsistencies across performances and make suggested changes on the electronic score.



Select rehearse to rehearse the same piece again or select another score.



Conductors can save and share their annotated scores and video of their rehearsal performance.

User Testing Procedure

The goals for our user testing will be to determine if:

- A) the interface is transparent and easy to use
- B) the functions of the system meet their needs



The prototype contained an interactive PowerPoint file showing the control panel and a printed banner with an image of an orchestra. We created three scenarios to lead the users through the system. The following questions were asked:

1. What is the first thing that you do when you enter this room?
2. How would you rehearse Beethoven's 9th Symphony?
3. On this slide, you can rearrange the orchestra and select the number of instruments you want. You want to add some violins, how would go about doing this?
4. So you are ready to play but you want to play the 4th movement, what do you do?
5. So you finished the movement. What do you do next?
6. If during the video, you notice a place where your movements are not controlling the music as you would like, what would you do when you notice this error?

User Testing Results

The interface is relatively easy to use:

- The icons and buttons were recognizable and there were no misunderstandings.
- The flow was intuitive to the conductors and there was no misunderstanding.

Not all of the functions meet their needs:

- Some user prefer to use their personal scores instead of an electronic score to mark cues or record notes.
- The comment section will not be used according to some user, as most notes are short and need to be placed directly on a specific location of the score.
- All users point out it would be distracting if they see a correction notice during practice; there should only be a static image of an orchestra as visual aid.

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