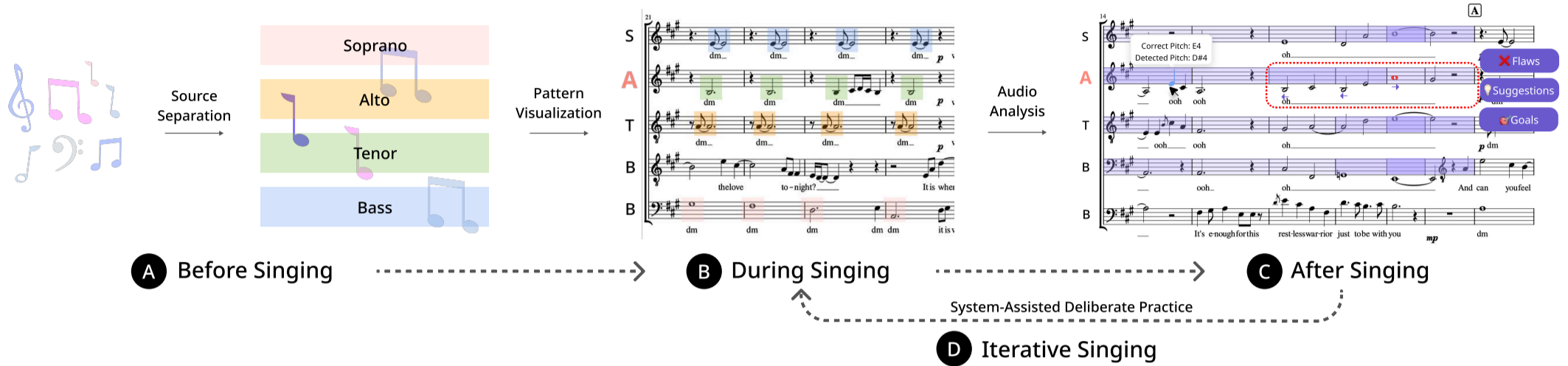


INTRODUCTION

Novice singers in collegiate A cappella groups often struggle with individual practice due to limited guidance and the challenges of asynchronous rehearsal. We propose **AcAMATE**, a system that supports individual practice by integrating group recordings, visualizing key a cappella musical patterns, and providing intuitive feedback to guide iterative deliberate practice.



USER CHALLENGES & DESIGN GOALS

A cappella parts are rhythmically and harmonically interdependent on each other. Practicing alone, novices lose the context of the entire group's voices.

DG1: Provide authentic vocal context by integrating the singer's own group recordings into individual practice.

In group rehearsals, peers quickly spot issues and provide feedback. Practicing alone misses such opportunities. Self-assessment is challenging for novices

DG2: Offer intuitive, context-aware feedback to help singers interpret self-performance and understand alignment with other parts.

A cappella rehearsals involve collaborative practice strategies. Practicing alone, novices cannot recreate targeted, flexible rehearsal strategies.

DG3: Enable guided and flexible creation of deliberate practice with adaptive feedback.

AFTER SINGING: VISUAL FEEDBACK ON PITCH, RHYTHM, DYNAMICS

The score shows feedback for the Soprano part. A tooltip indicates: "Correct Pitch: E4, Detected Pitch: D#4". A red dashed box highlights a pitch error. A blue dashed box highlights a dynamic issue. A green dashed box highlights a rhythmic issue.

ITERATIVE SINGING: DELIBERATE PRACTICE OF WEAK SEGMENTS

BEFORE SINGING: VOICE PART PREPARATION

The score highlights three key patterns for preparation:

- Homophony:** multiple parts singing the same rhythm on different pitches.
- Layered entrances:** a melody introduced by one part and echoed by others in sequence.
- Call-and-Response:** one part "calls" with a melodic phrase and another answers.
- Rhythmic Interlock:** parts contributing complementary rhythms.

DURING SINGING: MUSICAL PATTERN HIGHLIGHT

What needs to be improved

Adjust timing: avoid rushing into the first note of each measure and keep a steady tempo throughout the segment.

Correct pitch accuracy on the highest note (slightly sharp A4).

Align dynamics with other parts by building a stronger crescendo instead of decrescendo, especially emphasizing strength in the last two measures.

Suggestions

Mute the Bass Part

Lower Soprano Volume

Goals:

Rhythm

Pitch

Dynamics

FUTURE WORK

Conduct longitudinal studies with novice singers from collegiate A cappella groups to evaluate the system's impact on learning and communication

Interview experienced a cappella singers or directors to gather experts' insights on the system

Explore other usage scenarios (e.g., asynchronous ensemble rehearsals)

Derive design implications for audio-based communication and learning