

Action-Coordinating Prosody

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Questions

What are the prosodic forms used for

- coordinating joint action?
- cueing actions?
- signaling intended actions?
- inhibiting actions?
- synchronizing actions?

Data

- A fast-paced a two-player cooperative game
- 19 games, 180 minutes total
- One fixed player and 19 novices



Method

Take 522K samples at various timepoints

For each, compute 164 prosodic features:

- spanning 6 seconds of context
- for each player
- {loudness, rate, high pitch, low pitch, wide pitch, narrow pitch, creakiness}

and 68 game-action features:

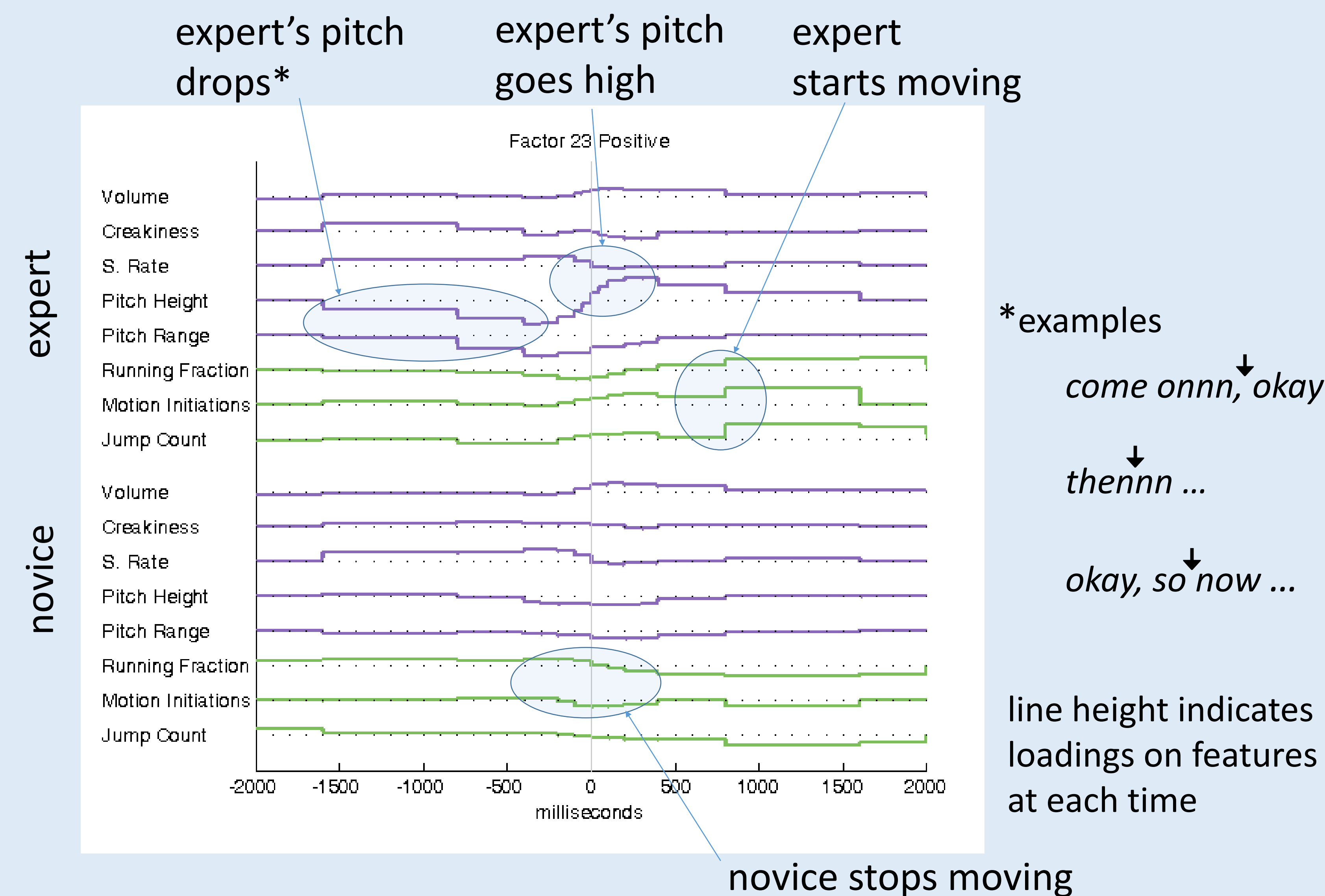
{left/right, run, jump}, for each player, over various windows

Apply Principal Components Analysis (PCA) to this set of samples, to obtain a set of dimensions/patterns

Interpret each by

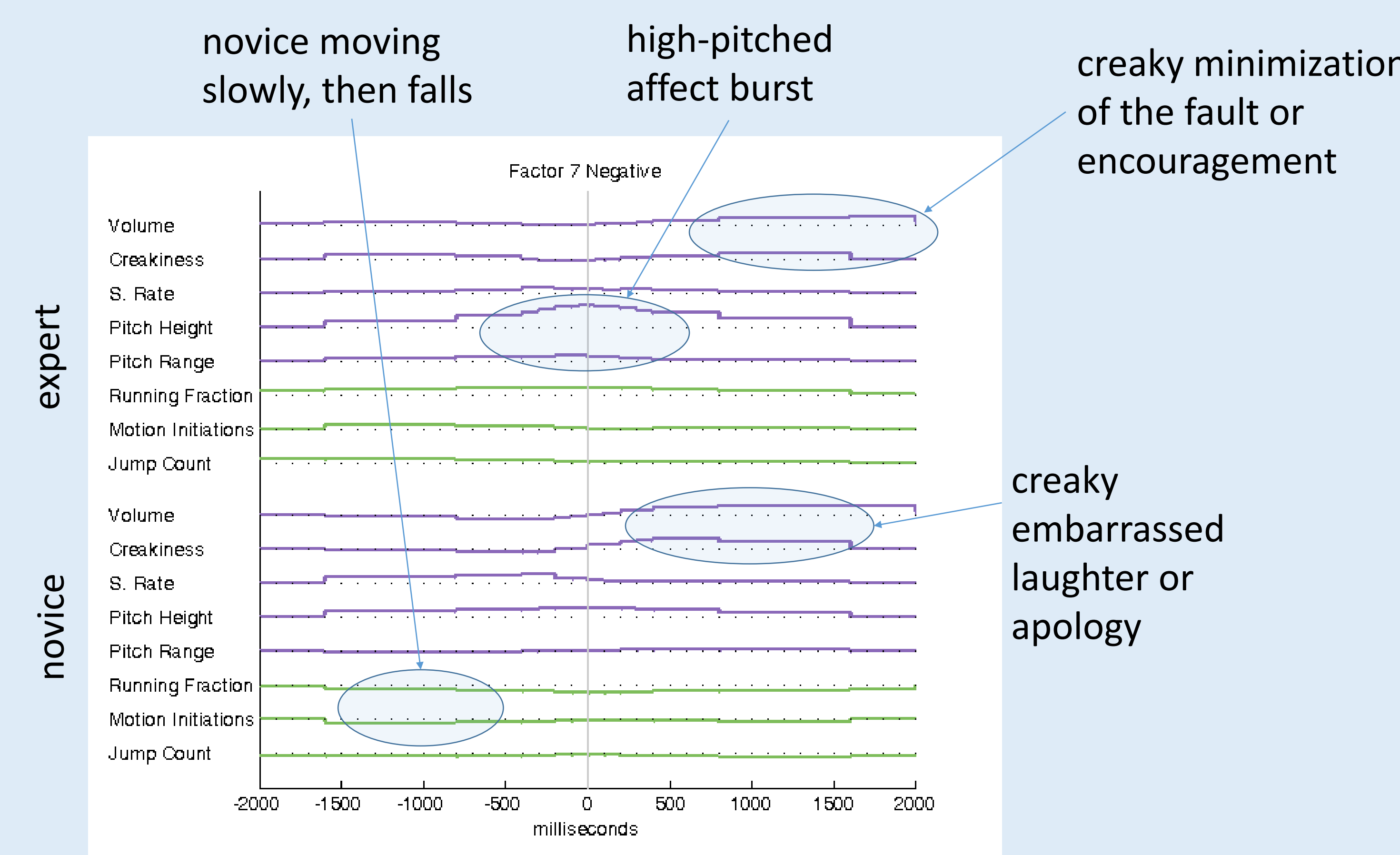
- examining timepoints where it is extremely positive or negative, by
- watching the gameplay etc. at those times

The Cue-the-Novice-to-Stop-Moving Pattern (23p)

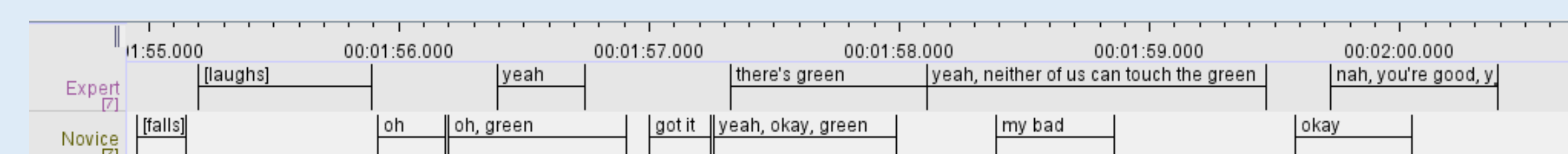


Note: At any time, usually multiple patterns are simultaneously active

The Fail-Apologize-Minimize Pattern (Factor 7n)



Example



Other Meanings/Functions of Prosody and Prosody-Action* Patterns

talking and not moving*	moving and not talking*
...	
concentrating, focusing	moving wildly, speaking excitedly*
deciding together	digressing, meta-comments
establishing a referent	tensely watching a tricky move
fail-apologize-minimize* (7n)	quiet satisfaction
breathy, pressed warning or reminder*	meeting expectation
short instructions	long instructions
...	
cueing novice to start moving*	cueing novice to stop* (23p)
figuring something out	still getting one's bearings
...	

Conclusion

English has specific prosodic patterns for coordinating action.

Open Questions

How general are these patterns?

Are they causal?

Are they mental entities?

Can we use them for speech synthesis? helping language learners? human-robot interaction?

Resources, etc.

Corpus: <http://www.cs.utep.edu/nigel/watergirl/>

Prosodic Feature Toolkit: <https://github.com/nigelward/midlevel>

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