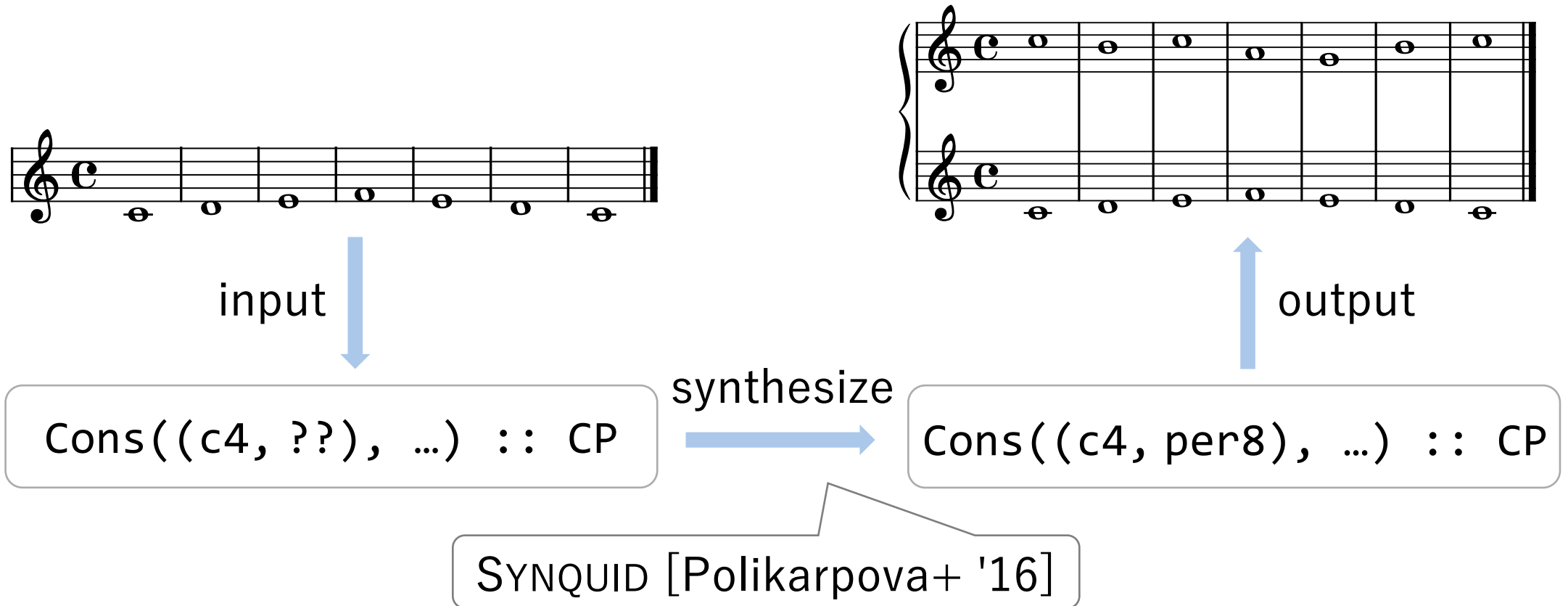


Towards a Type Theory for Verifying Gradable Properties

Youyou Cong (Tokyo Institute of Technology)

Initial goal: Type-based synthesis of music



Challenge: Non-mandatory rules

- Imperfect intervals are preferred



- Repeated notes are not preferred



Proposal: Weighted refinement types

CP = list (pitch × interval) < Ψ_1 , Ψ_2 >

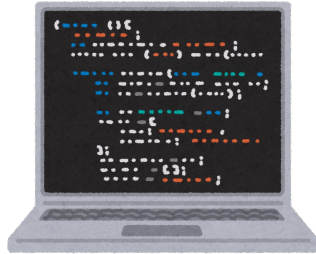
Ψ_1 = imperfect₄₀; dissonant_{-∞}

Ψ_2 = contrary₅₀; repeated₋₃₀

Gradable properties in other domains

- Data precision in approximate computing
 - Cf: precision types (Boston+ '14)
- Likelihood of situations in natural language semantics
 - Cf: probabilistic type theory (Cooper+ '15)

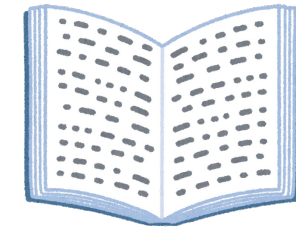
Next step: General type theory with grades



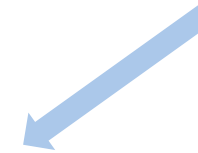
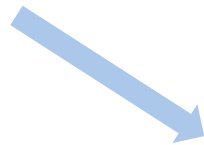
Precision
Types



Weighted
Refinement Types



Probabilistic
Type Theory



General Type Theory