

# Fight Against Variant Tempo

## ----Query by Humming and Clapping

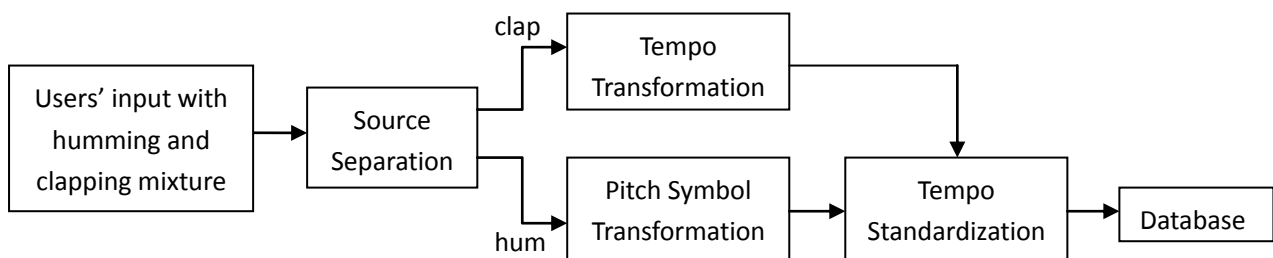
Ruofeng Chen

Pattern Recognition and Intelligent System Lab  
Beijing University of Posts and Telecommunications  
[rogerkeane1016@gmail.com](mailto:rogerkeane1016@gmail.com)

### Abstract

Query by Humming (QbH) is nowadays a hotspot research in the field of Music Information Retrieval (MIR). One upsetting problem is the intangible tempo in users' humming because variant tempo makes alignment work slow and inaccurate.

In this presentation, we present a new way named Query by Humming and Clapping (QbHC), which assists QbH system with tempo information. Users hum and clap synchronically when Record button is pushed. QbHC system uses signal separation methods to set apart hummed rhythm and clapped beats. Clapped beat can be transformed to tempo information and used to scale hummed rhythm into standard tempo which will be more convenient for alignment work and save time for dynamic programming algorithms.



### Research Background

In most QbH systems, input samples contain only hummed rhythms. Whiling testing the QbH system which we made on our own, by asking 50 people with different music levels to sing, we found that about 20 people preferred to automatically swing their hands and fingers or nod their heads for timing. It means that not a few people have the concepts of tempo in music and try to sing in a constant tempo. This idea inspires us to make a querying system which allows users to sing and clap at the same time. The concept flow graph is shown above.