



香港城市大學
City University of Hong Kong

GASLA: Enhancing the Applicability of Sign Language Translation

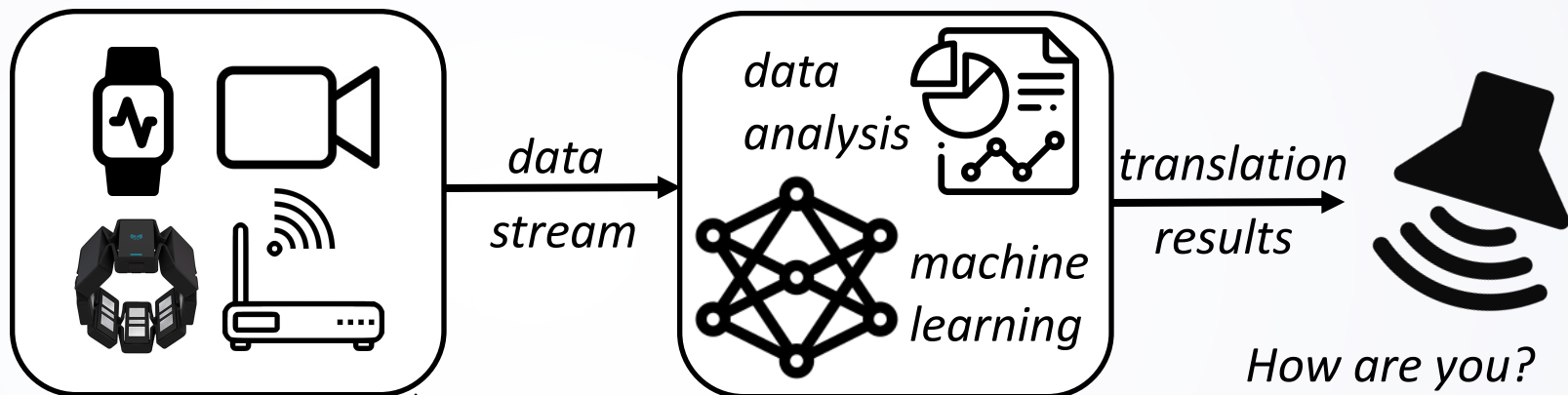
Jiao Li, Yang Liu, Weitao Xu, Zhenjiang Li
City University of Hong Kong

Background

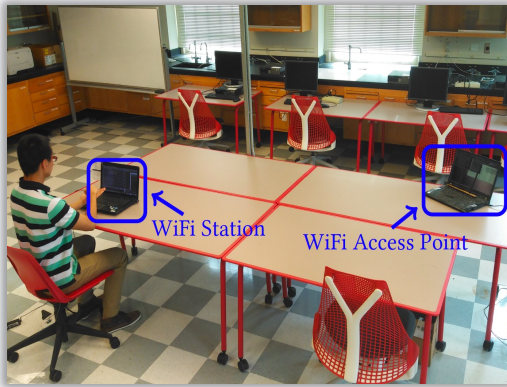


A communication bridge needs to be built !

Sign Language Translation

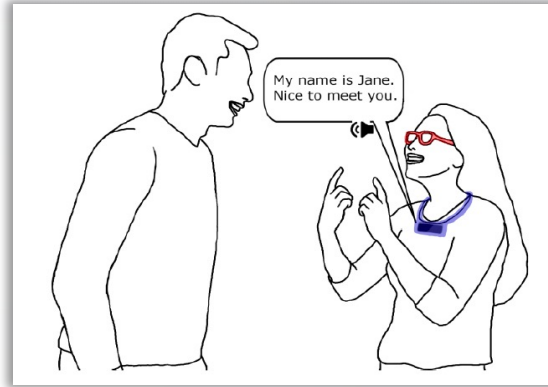


Existing works



[IMWUT'18]

Wireless based
not ubiquitous
multipath effect



[SenSys'17]

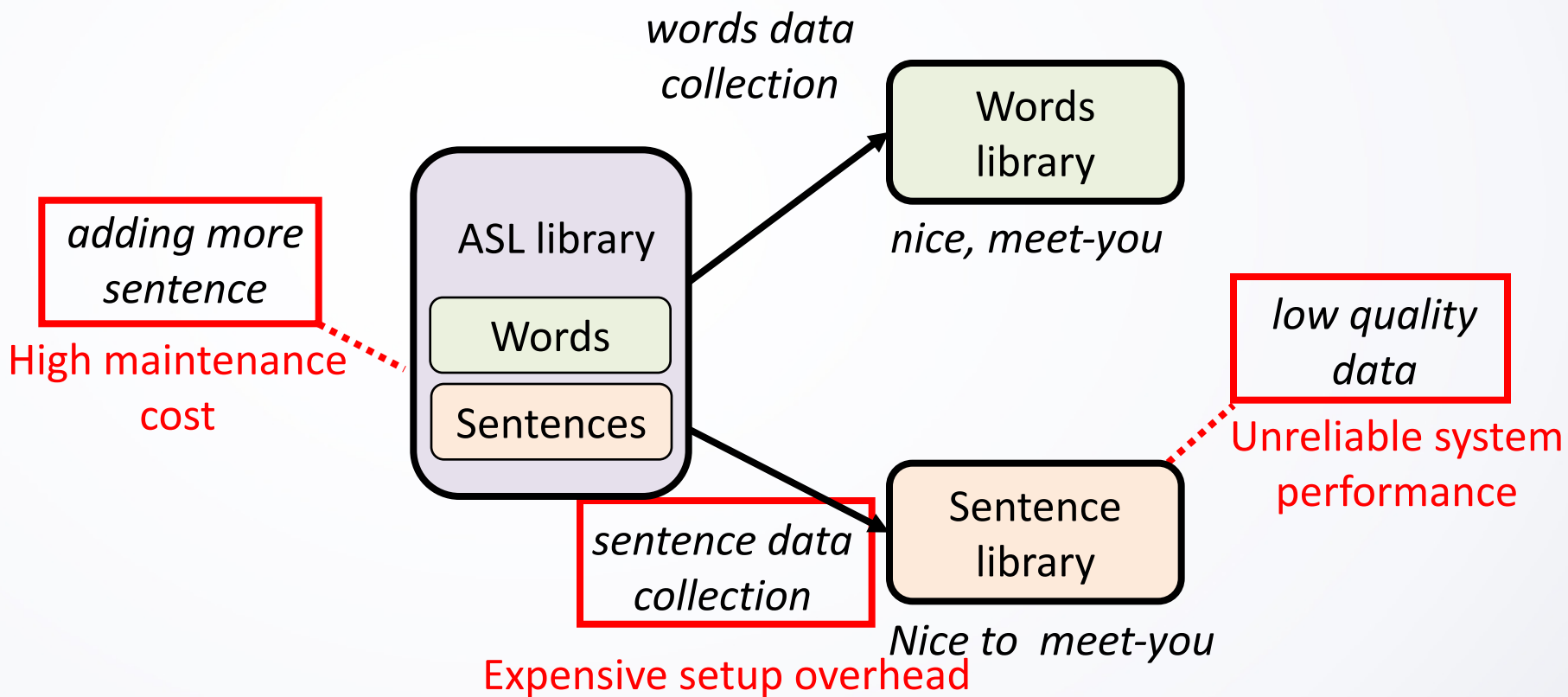
Camera based
privacy leakage
ambient light



[MobiCom'19]

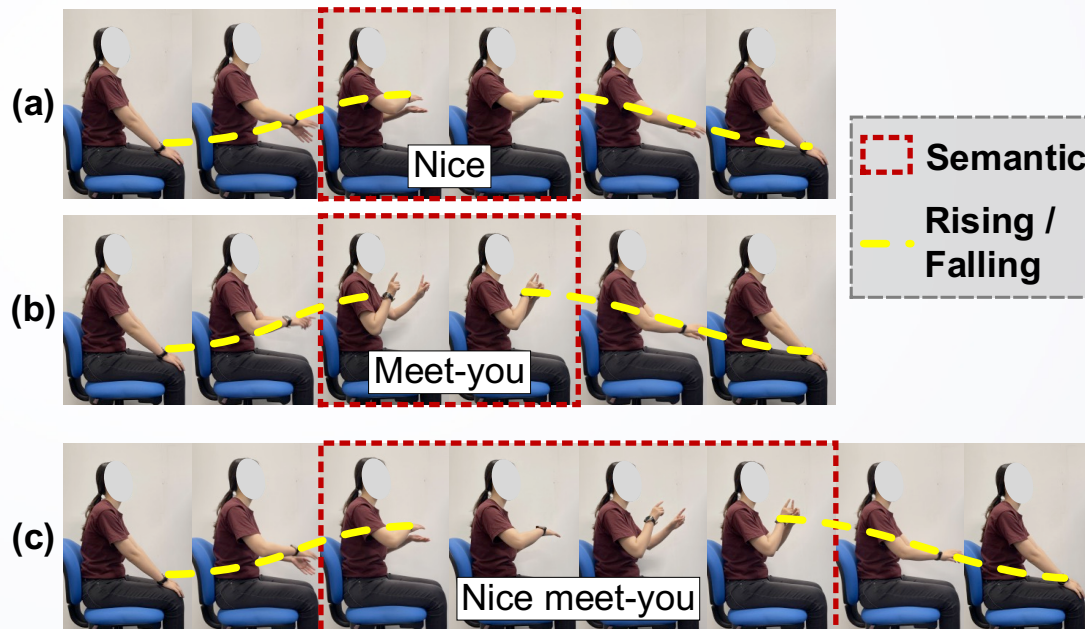
Wearable based
ubiquitous
privacy-protected

Applicability issues



Our idea

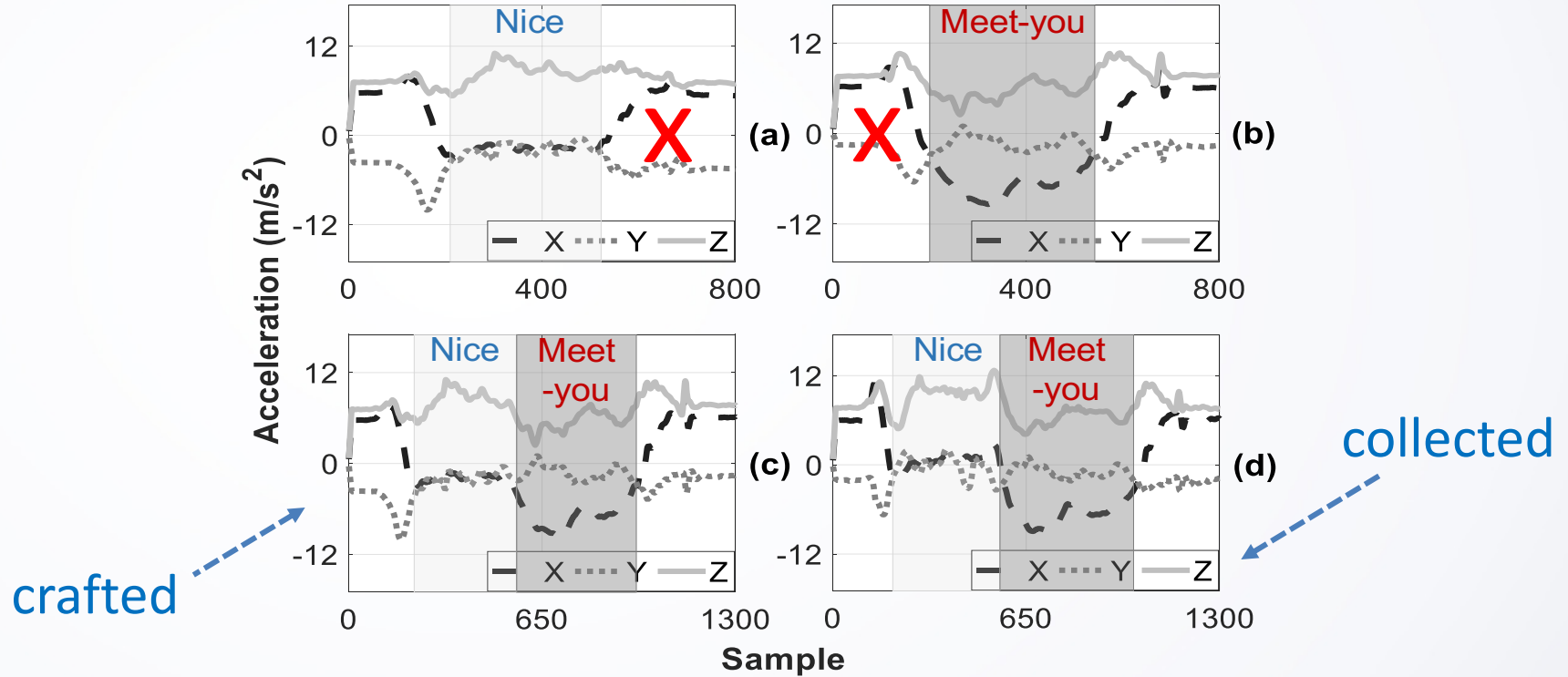
- Sentences can be crafted by words!



- Connect two words directly?

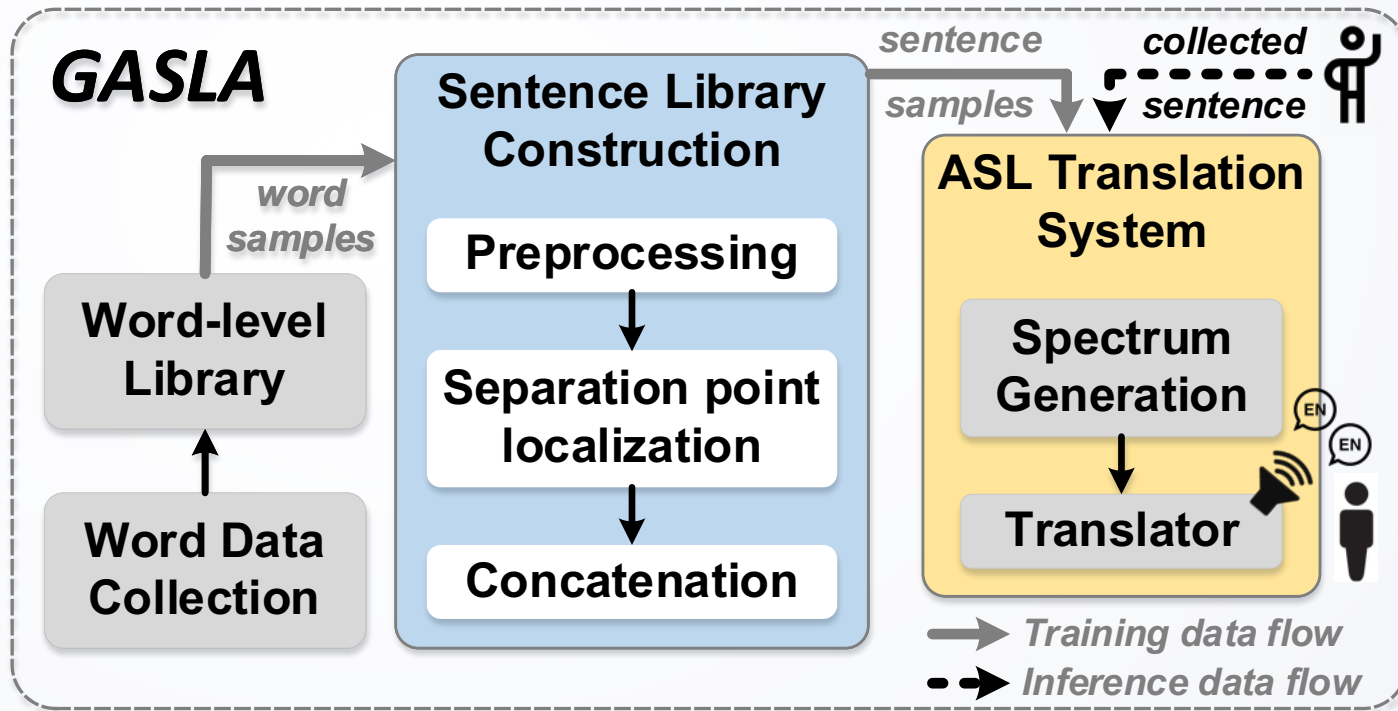
The answer is **NO** !

Observation





- Two traces share *similarity*
- *Separation point*

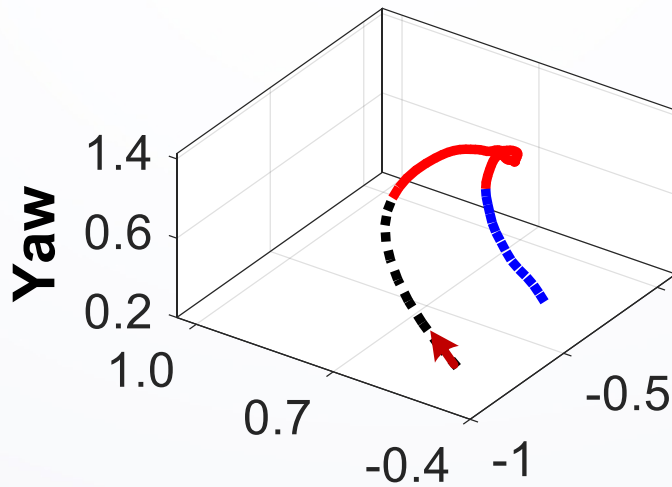
Our system----GASLA



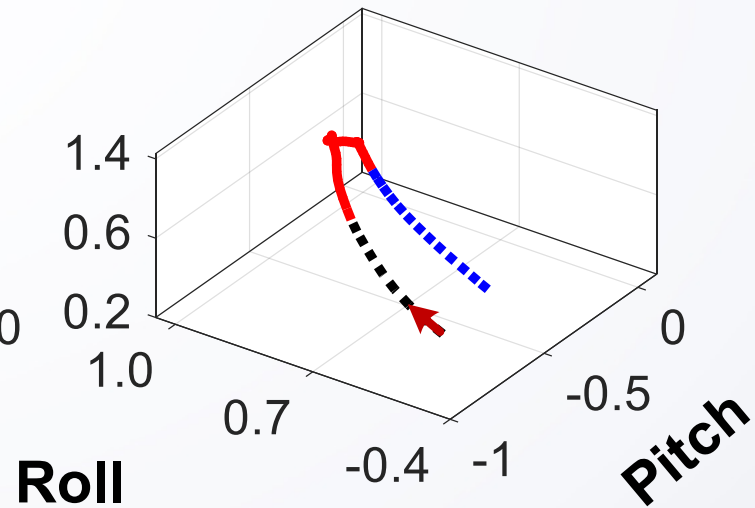
Trajectory selection

- Moving trajectory? 
- Orientation? 

..... Rising — Semantic Falling



(a)

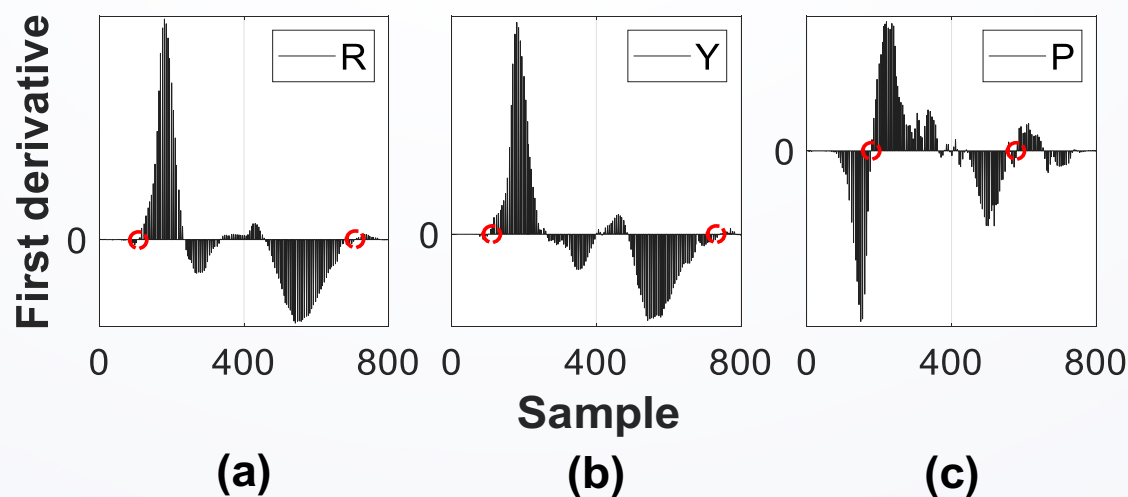
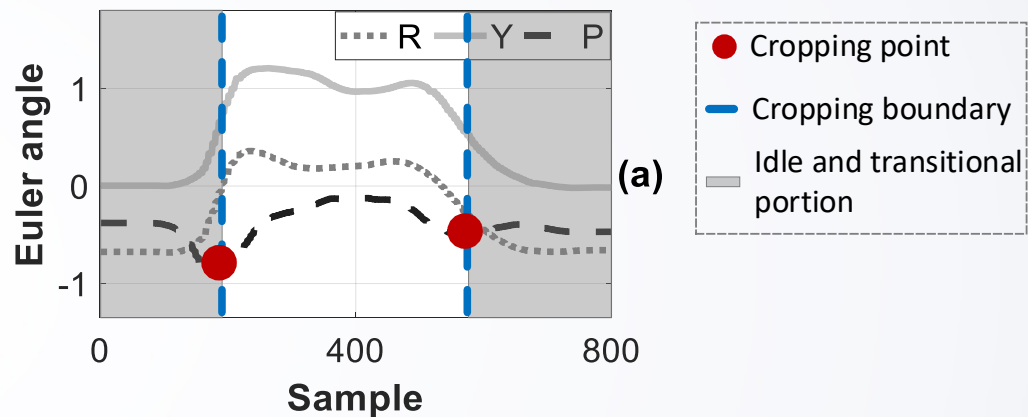


(b)

Sentence Library Construction

- Step1: Preprocessing

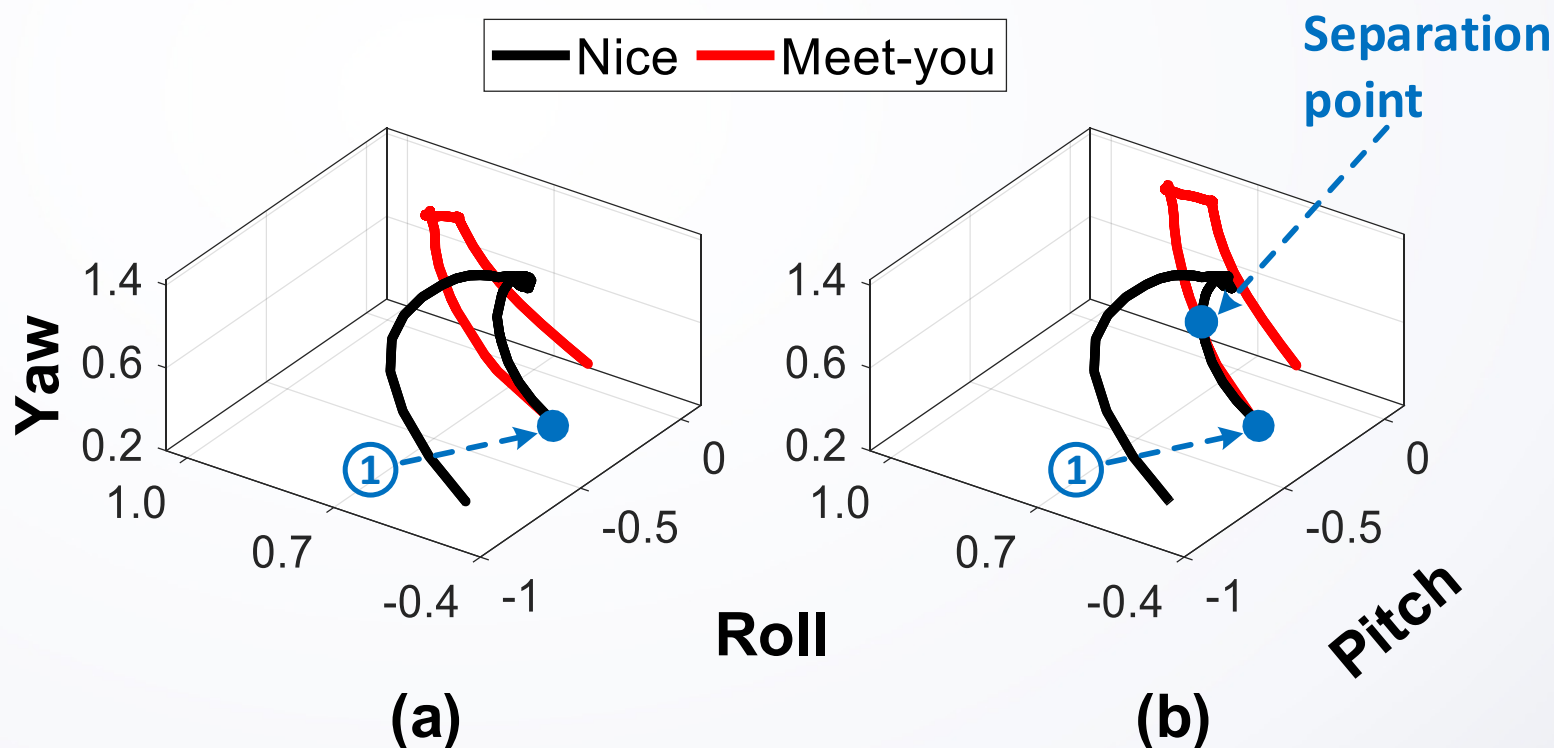
a) signal cropping



b) resampling

Sentence Library Construction

- Step2: Separation point localization



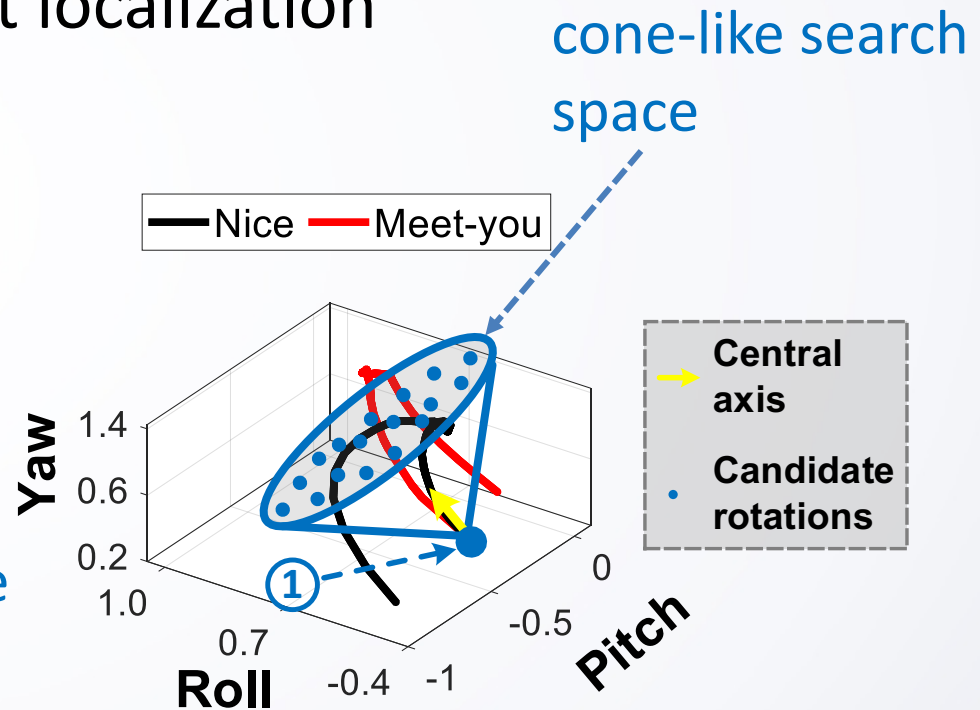
Sentence Library Construction

- Step2: Separation point localization

$$\min_{\{r_y \in space\}} d(\mathbf{ori}'_x, r_y \cdot \mathbf{ori}_y)$$

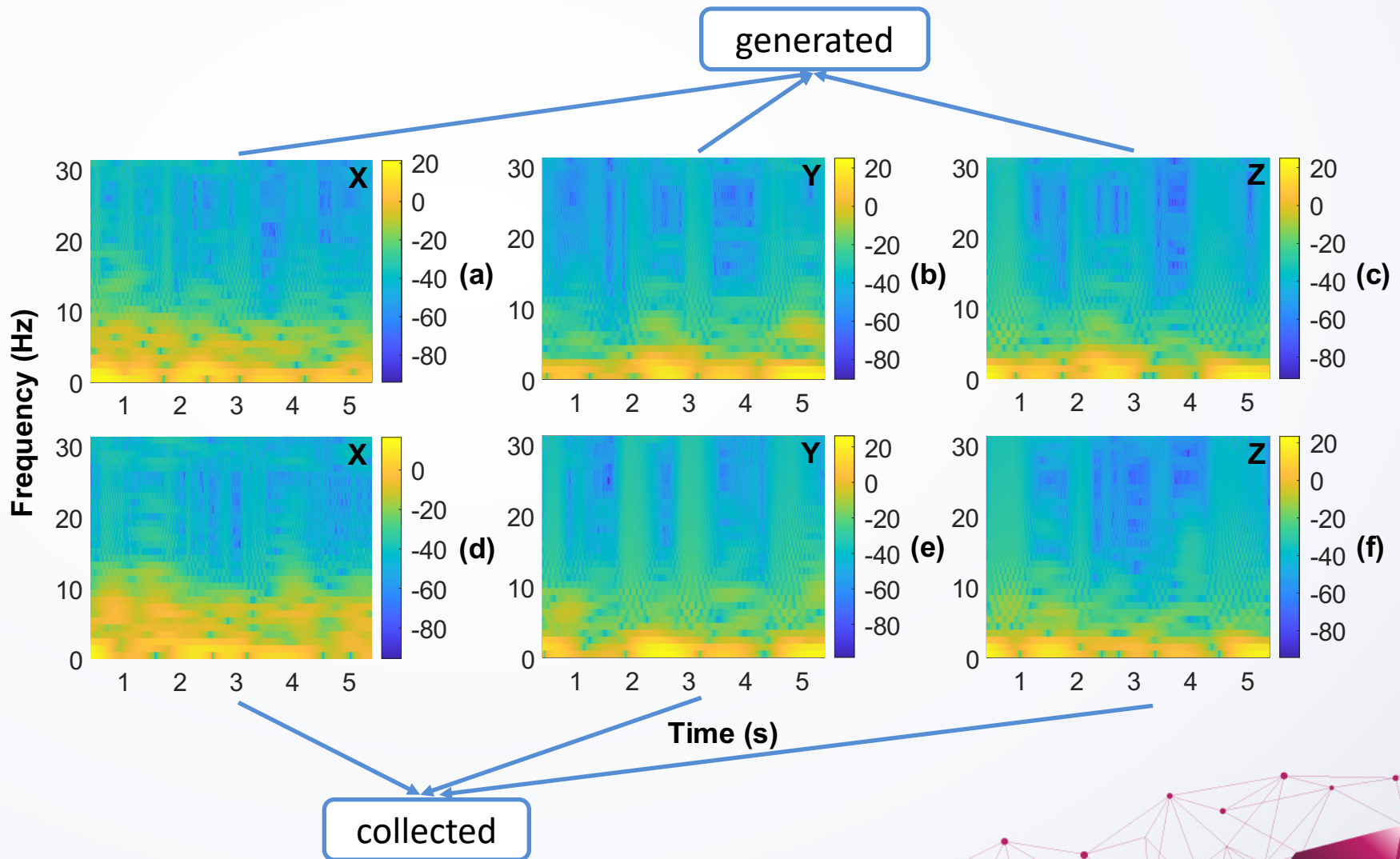
first trace

rotation matrix second trace



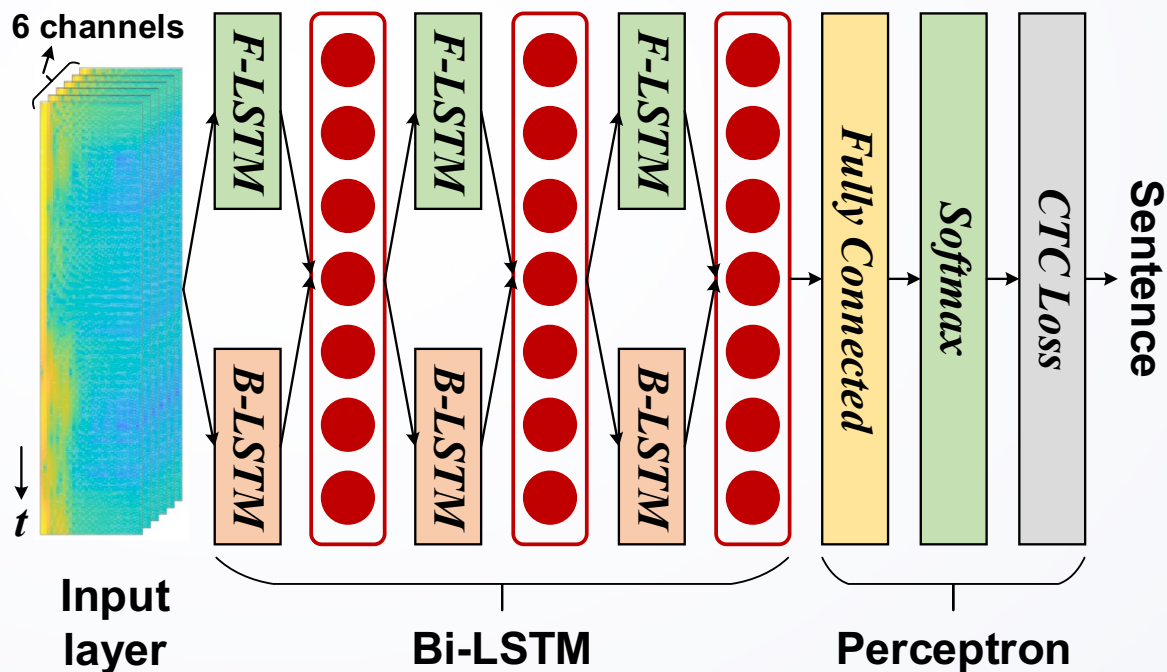
- Step3: Concatenation

ASL Translation



ASL Translation

- Our target: provide an independent component



- Network input
- Neural network structure

Experiment setup

- Hardware

LG Watch, SAMSUNG Galaxy S7,
Desktop (Intel i7-8700K CPU and Nvidia 2080Ti GPU)

- Data collection

69 words and 41 sentences
6 volunteer

- Metric

Accuracy = 1 – word error rate

- Methods

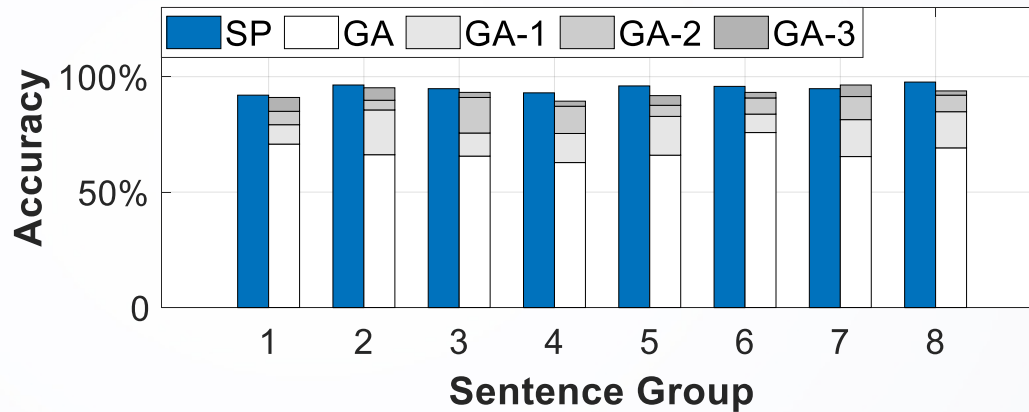
SignSpeaker(SP): the state-of-the-art

GASLA(GA): our design

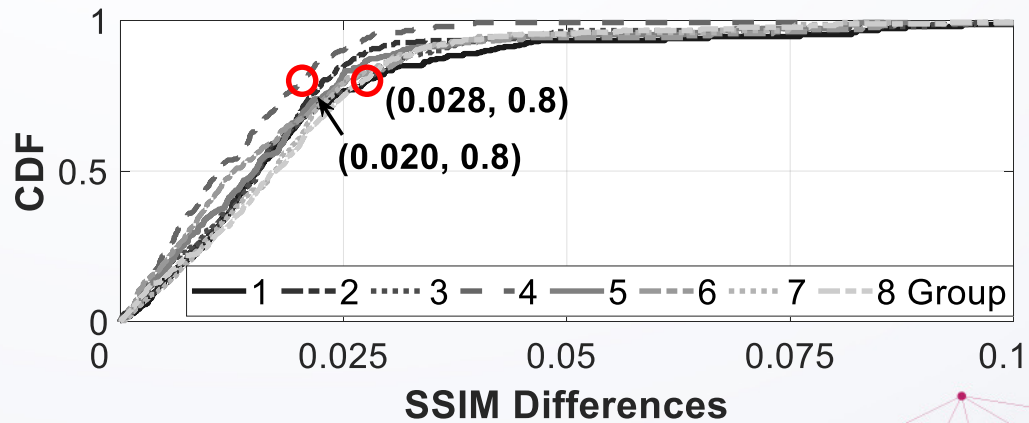


Evaluation results

- Overall performance



- Quality of generated sensory data



Conclusion

- We **identify an applicability issue** commonly in prior ASL systems.
- We **propose effective techniques** to address these issues and provide a clear interface to existing ASL systems.
- We **develop a prototype** of *GASLA* and conduct extensive experiments.