

# Developing a software framework for social robots: Some issues and experiences

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ICSR 2017 WORKSHOP ON SOCIAL ROBOT  
INTELLIGENCE FOR SOCIAL HUMAN-ROBOT  
INTERACTION OF SERVICE ROBOTS  
November 2017

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# Social Robots meet Chatbots

- Conversation is an essential communication channel for social robots
- Developing applications for Social Robots  $\approx$  Writing dialog scripts
- Chatbot is a specialized tool for implementing interactive communicative dialogs
- Chatbot script languages are simple and easy-to-use, even for non-experts

# Development in Chatbots

```
s: ( I like spinach ) Are you a fan of the Popeye cartoons?  
  
  a: ( ~yes ) I used to watch him as a child. Did you lust after Olive Oyl?  
    b: ( ~no ) Me neither. She was too skinny.  
    b: ( yes ) You probably like skinny models.  
  
  a: ( ~no ) What cartoons do you watch?  
    b: ( none ) You lead a deprived life.  
    b: ( Mickey Mouse ) The Disney icon.  
  
#! I often eat chicken  
u: ( ![ not never rarely ] I * ~ingest * ~meat ) You eat meat.
```

Social Robots + Chatbots = Application Development on Steroids

# Naoqi QiChat

- ChatScript<sup>1</sup>-based Dialog Specification
- Multi-modal Event Processing
- Multi-modal Robot Control

## An Example of Event Processing

```
u:(be my puppet) ok, touch my leg or ask me
u:(e:LeftBumperPressed "move this leg") ok I move the left leg
u:(e:LeftBumperPressed "light this leg") ok I turn leds on left leg
```

## An Example of Robot Motion Control

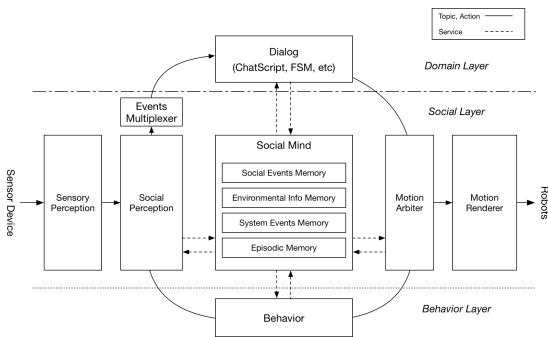
```
Hello! ^start(animations/Stand/Gestures/Hey_1) Nice to meet you
```

---

<sup>1</sup><http://chatscript.sourceforge.net>

## Yet another framework, SHRI

- A Social HRI Framework for Social Robots<sup>2</sup>
- RiveScript-based Dialog Specification
- Multi-modal Event Processing and Robot Control



<sup>2</sup>A collaborative work with KITECH and HSU

# Event Processing in SHRI

```

> topic exception_person_disengaged
  + e:person-disengaged
    - <overriding=1> 상담이 지루하시더라도 집중해 주시면 감사하겠습니다.
    - <overriding=1> 노잼이어도 알아두시면 괜찮은 정보입니다. 집중해주세요.
    - <overriding=1> 우리 서로 얼굴을 보고 얘기하면 좋을 것 같아요.
    - <overriding=1> 제 얼굴을 봐주시면 안될까요?
< topic

> topic t_scenariostart inherits exception_person_disappeared
  + (e:person-engaged|안녕)
    - {topic=getperson}{@start}
< topic

> topic getperson
  + start
    - <call>mget person_detection/person_id[0] face_id</call>
< topic

```



# Robot Behavior control and Context Referring in SHRI

```

> topic greeting
  + start
  - <br=1> <sm=tag:greeting[happiness]> 만나서 반갑습니다. 저는 스킨케어 로봇입니다.
  - <br=1> <sm=tag:greeting[happiness]> 안녕하세요? 만나서 반갑습니다. 저는 스킨케어
  - <br=1> <sm=tag:greeting[happiness]> 만나서 반갑습니다. 저는 스킨케어 로봇입니다.
  - <br=1> <sm=tag:greeting[happiness]> 안녕하세요? 저는 스킨케어 로봇입니다. {@ne}

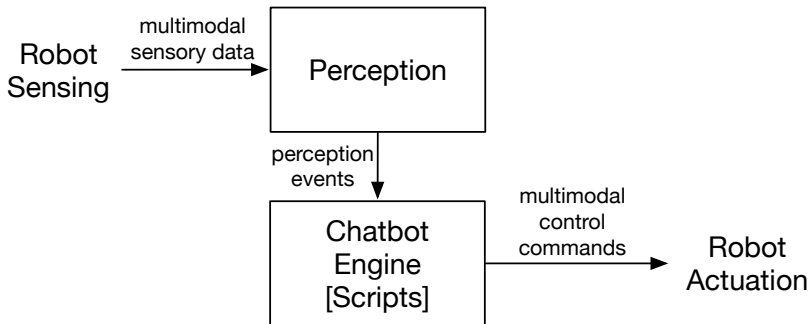
  + next
  - <br=0> 어디 보자, 방문한 적이 있는지 알아보려고요. {topic=getname_first}{@start}
  - <br=0> 고객님의 얼굴을 인식 중입니다. 잠시만요. {topic=getname_first}{@start}
  - <br=0> 제 기억속에서 당신을 찾고 있어요. 잠시만요. {topic=getname_first}{@start}
< topic

> topic getname_first
  + start
  - <call>mget person_identification/name[session_face_id:face_id]</call>
  - <call>mget person_identification/name[session_face_id:face_id]</call>
< topic

```

# Chatbot-oriented Social Robot Framework

- Chatbot-based Application Development
- Multi-modal Perception and Control
- Reactive Control Idioms



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# False Positive Perceptions

- False positive detections do happen frequently
- False positive detection with reactive control triggers nonsensical behaviors e.g. Saying hello to a distant object
- Reducing false alarm do harms on true positive detections too

# Perceptual Discontinuity

- Percepts are not always consistent e.g. Face recognition alternating between two IDs
- Reactive actions break easily

# Too simple to support Multi-party Interactions

- Multi-party interaction is unavoidable for serving people in open spaces
- Writing multi-party interactions in ordinary chatbot script language is too complicated
  - indexing each user in interaction
  - maintaining context for each user
  - referring to context items and events for each user
- Extending chatbot script languages is not a solution. Supporting complicated interaction scenarios make script languages too complex to use.

# Chatbots and Robots are for different purposes, anyway

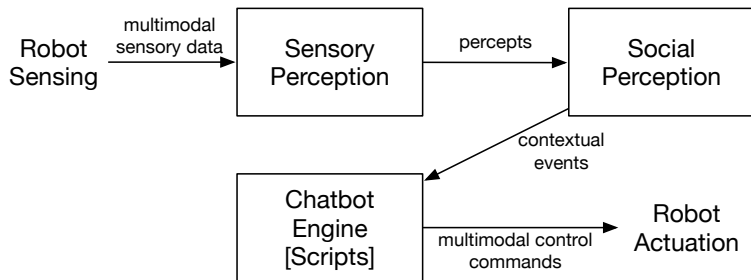
<b>Chatbot</b>	<b>Robot</b>
One-to-One Interaction	Multiparty Interaction
Single Modality	Multiple Modality
Reactive	Proactive

So...

Chatbot-oriented social robot frameworks need improvements to fill the gaps.

# Band-Aid Solutions in SHRI

## Two-Staged Perception Process





## ■ Functions of Social Perception

### ■ Abstraction

- e.g. face recognition, id tag recognition → *person-identified*
- Scripting in more general reusable events

### ■ Filtering

- Majority Voting
- Moving Average

### ■ Social Context Recognition for attention, engagement etc

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## Concluding Remarks

- Employing Chatbots in Social Robot Frameworks provides benefits in application developments and architecture integration.
- Chatbots are designed to support one-to-one, purely reactive and uni-modal interactions.
- Extending chatbots for multi-modal event processing incurs problems due to perception errors.
- Design considerations and improvements are necessary to systematically enable perceptual consistency, perceptual continuity, and better support for complex interactions.