



Facebook Aware Virtual Humans

Gengdai Liu, IMI
liugengdai@ntu.edu.sg

Outline

- ▶ Motivations
- ▶ Background
- ▶ System overview
- ▶ Information extraction
- ▶ Dialogue planning
- ▶ Experiments



Outline

- ▶ **Motivations**
- ▶ Background
- ▶ System overview
- ▶ Information extraction
- ▶ Dialogue planning
- ▶ Experiments



Motivations (I)

- ▶ Conventional virtual human interface



- ▶ 3D online community



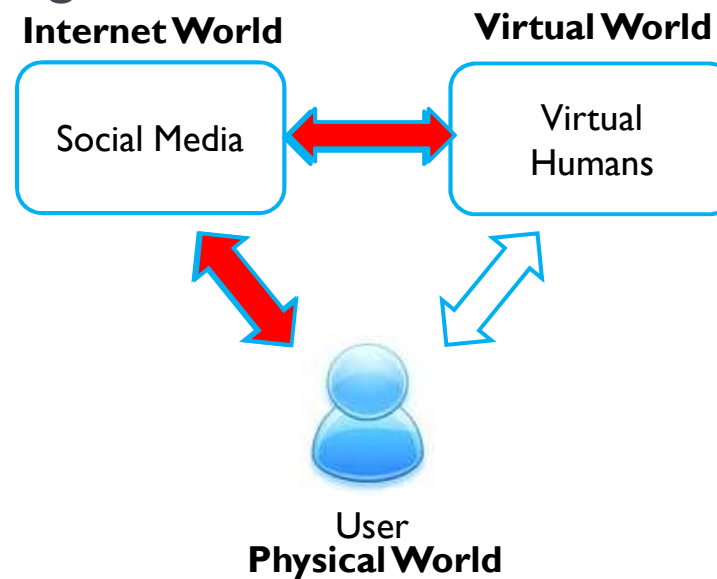
- ▶ The future ?

- ▶ combination of virtual reality and social networks will produce entirely new forms of social interaction [Bailenson 2011]



Motivations (II)

- ▶ **Facebook Aware Virtual Human Interface**
 - ▶ Connect internet world, virtual world and physical world
 - ▶ Make a virtual human behave like a modern human of new generation
 - ▶ Social media provides virtual humans with a dynamically updated knowledge database



Research questions

- ▶ Can linking virtual humans with social networking sites enhance interaction between humans and virtual humans compared to conventional face-to-face real human-virtual human social conversational interaction?
- ▶ How can we take good advantage of information obtained from social networking sites to improve the effectiveness of social interaction between humans and virtual humans?



Outline

- ▶ Motivations
- ▶ **Background**
- ▶ System overview
- ▶ Information extraction
- ▶ Dialogue planning
- ▶ Experiments



Social agents

- ▶ What factors influence interaction with social agents
 - ▶ Gesture [Maatman 2005, Neff 2008]
 - ▶ Gaze [Garau 2003, Lance 2010, Andrist 2012]
 - ▶ Head movement [Yamazaki 2008]
 - ▶ Emotion (agent [de Melo 2010 and user [Saerbeck 2010])
 - ▶ Memory [Kasap 2012]
 - ▶ Other channels (e.g. bio-signals from ECG [Szafir 2012] and EEG [Groenegrass 2010])



Social media

- ▶ **Human-human interaction on social networking sites**
 - ▶ How romantic partners use Facebook [Zhao 2012]
 - ▶ Jiang Farmer's Tale [Gilbert 2009]
- ▶ **Emotion on social networking sites**
 - ▶ Emotion spread [Kramer 2012]
 - ▶ Emotion detection [Tang 2012]
- ▶ **Human-animal interaction**
 - ▶ Catlog [Yonezawa2009]
- ▶ **Human-agent interaction through social media**
 - ▶ Facebots [Mavridis 2009]
 - ▶ Enhancing the robot service [Emeli 2010]
 - ▶ Robots in my contact list [Ma 2012]



FaceBots

▶ FaceBots

- ▶ N. Mavridis, C. Datta et al, Facebots: Social robots utilizing and publishing social information in Facebook, IEEE Human Robot Interaction, 273-274, 2009

- FaceBots: (1) it behaves more like a feed reader and does not process the social information and use it as helpful knowledge to respond accordingly to users. (2) No user study
- We (1) takes full advantage of a user's profile, social networks and emotions to augment the pleasing nature of the virtual human. (2) Two experiments



Service robots

- ▶ Enhancing the robot service experience through social media
 - ▶ Emeli, H. Christensen. Enhancing the robot service experience through social media, IEEE RO-MAN 2010, 288-295 , 2010
- ▶ Robots in my contact list
 - ▶ X. Ma, X. Yang, S.D. Zhao, et al, Robots in my contact list: Using Social media platforms for human-robot interaction in domestic environment, ACM APCHI, 133-140, 2012.
 - These works only use social networking sites as intermediate platforms to command the robot, but no social information is used for better face-to-face interaction.



Novelty

- ▶ First work that links virtual human with social networking sites, from which we obtained information to generate conversation
- ▶ First work to conduct experiments to study whether and how using social networking sites can enhance the human-virtual human interaction, which can be used as a guideline to future virtual human interface development
- ▶ Behavior tree, data from Facebook and Natural language processing (NLP) techniques are combined to plan and manage the dialogue and other behaviors.

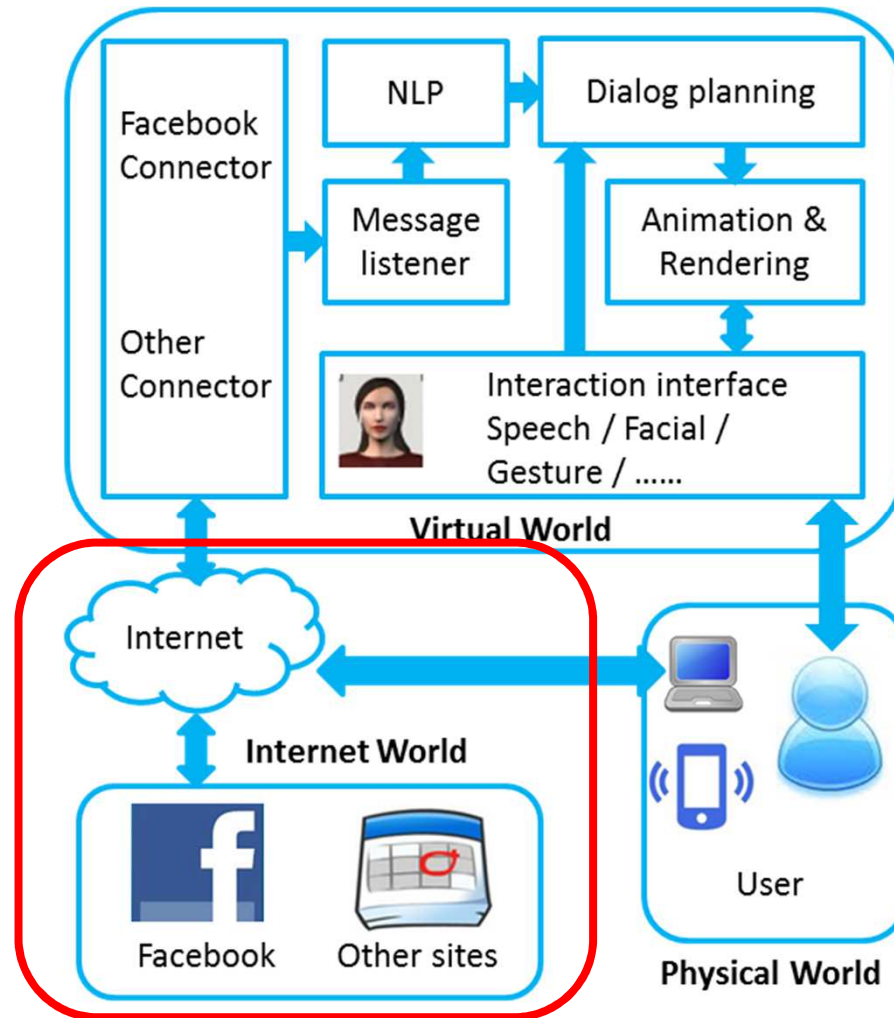


Outline

- ▶ Motivations
- ▶ Background
- ▶ **System overview**
- ▶ Information extraction
- ▶ Dialogue planning
- ▶ Experiments



Overview of the system

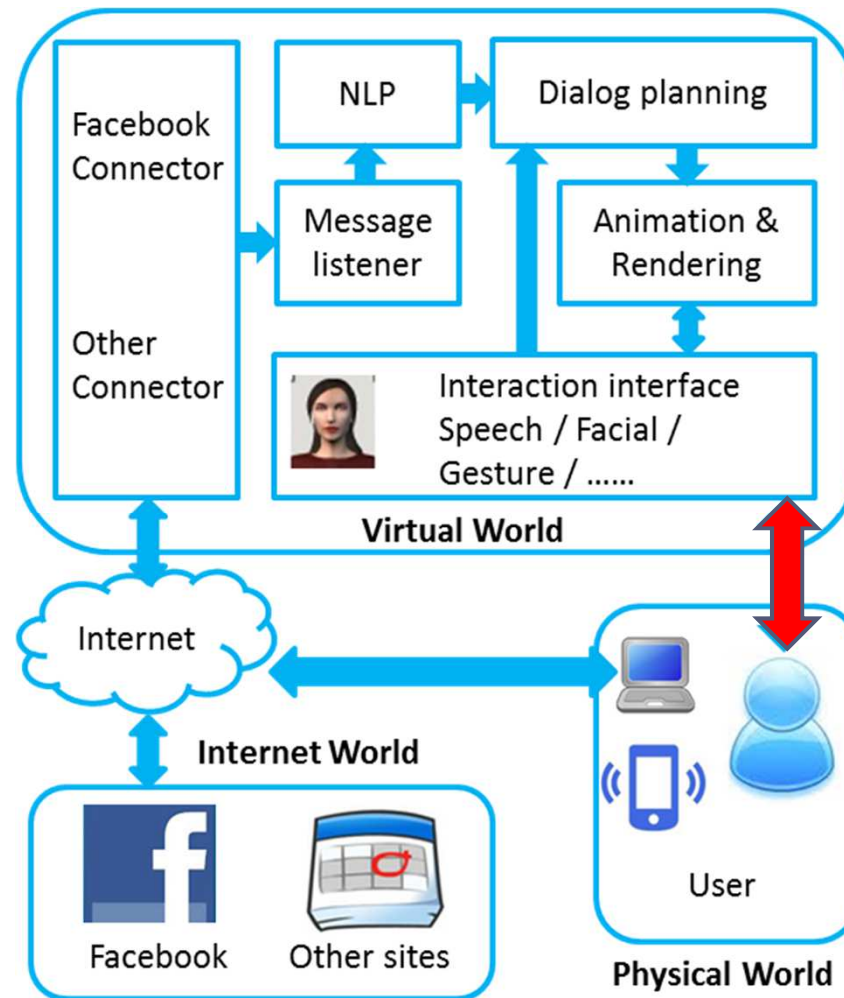


Virtual human control and interaction

- ▶ Our virtual human is not a online ChatBot
- ▶ Instead of studying only user experience with an agent on Facebook, we would like to study the user experience with a Facebook aware virtual human in daily life

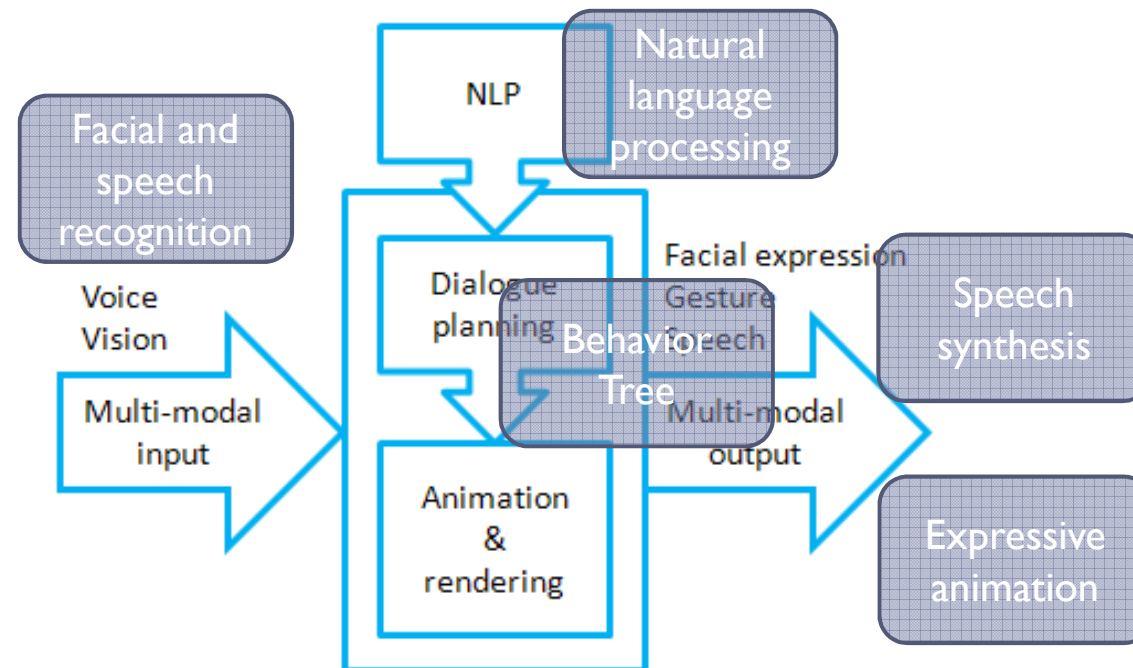


Overview of the system



Virtual human control and interaction

- ▶ Our virtual human is not a online ChatBot
- ▶ Instead of studying only user experience with an agent on Facebook, we would like to study the user experience with a Facebook aware virtual human in daily life



A simple scenario

- ▶ Sophie works with Facebook and Google calendar

The image shows a Facebook post by Sophie Imi, posted 6 seconds ago via SocialAgents. The post text is "I am meeting with John from School of Computer Science at Media Lab". Below the text is a photo of a man with glasses, John, who is making a peace sign. At the bottom of the post are the options "Like · Comment · Share".

To the right of the Facebook post is a Google Calendar event card. The event is titled "John, School of Computer Science" and is scheduled for "Tue, January 8, 3:30pm – 5:00pm" at "Media Lab". The card includes a "Delete" button and an "Edit event »" button. A red callout box points to the event card, containing the text "3:30p – 5p John, School of Computer Science".

Two blue speech bubbles are overlaid on the image. One points to the Facebook post and contains the text "Facebook". The other points to the Google Calendar event card and contains the text "Google Calendar".

Outline

- ▶ Motivations
- ▶ Background
- ▶ System overview
- ▶ **Information extraction**
- ▶ Dialogue planning
- ▶ Experiments



Knowledge base creation

- ▶ We have Sophie interested in movies and have much knowledge about movies
- ▶ We build a knowledge base for her using data crawled from IMDb and RottenTomatoes websites
- ▶ We classify movie reviews using Naive Bayes classification to get most positive and most negative review which can be used based on users liking or disliking
- ▶ We use NLP to get information related to people involved, genre and other details about movies



Emotion analysis from Texts

▶ Sentimental analysis

- ▶ Neg and Pos Mood
- ▶ Dataset: Thinknook (from twitter)
- ▶ We have tested different classifiers (Naive Bayes, Multinomial Naive Bayes, Decision Tree and SVM) with same dataset, the best results are from Naive Bayes with accuracy of 0.726852

Classifier	Accuracy	Negative Precision	Positive Precision
Naive Bayes (NB)	0.747207	0.685676	0.868909

▶ Emotion extraction

- ▶ 'anger', 'fear', 'joy', 'sadness'
- ▶ Data sets: ISEAR
- ▶ Best results : Multinomial Naive Bayes with accuracy of 0.726852



Outline

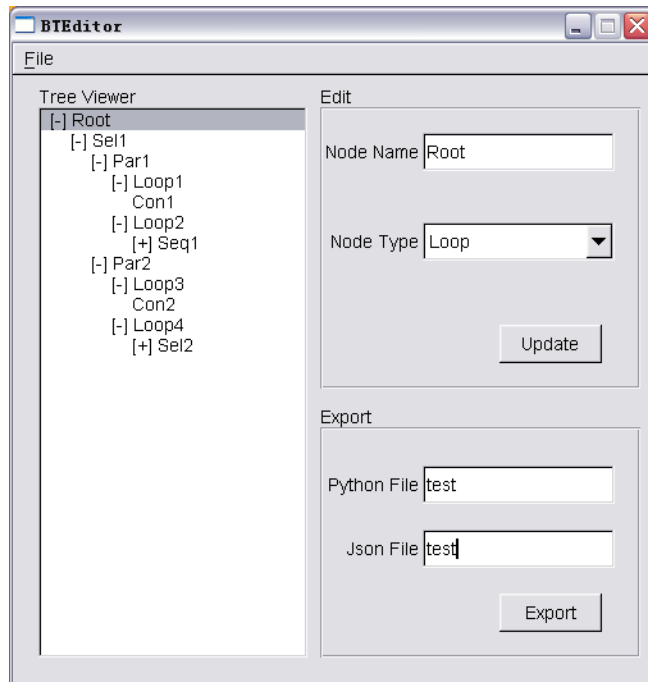
- ▶ Motivations
- ▶ Background
- ▶ System overview
- ▶ Information extraction
- ▶ **Dialogue planning**
- ▶ Experiments



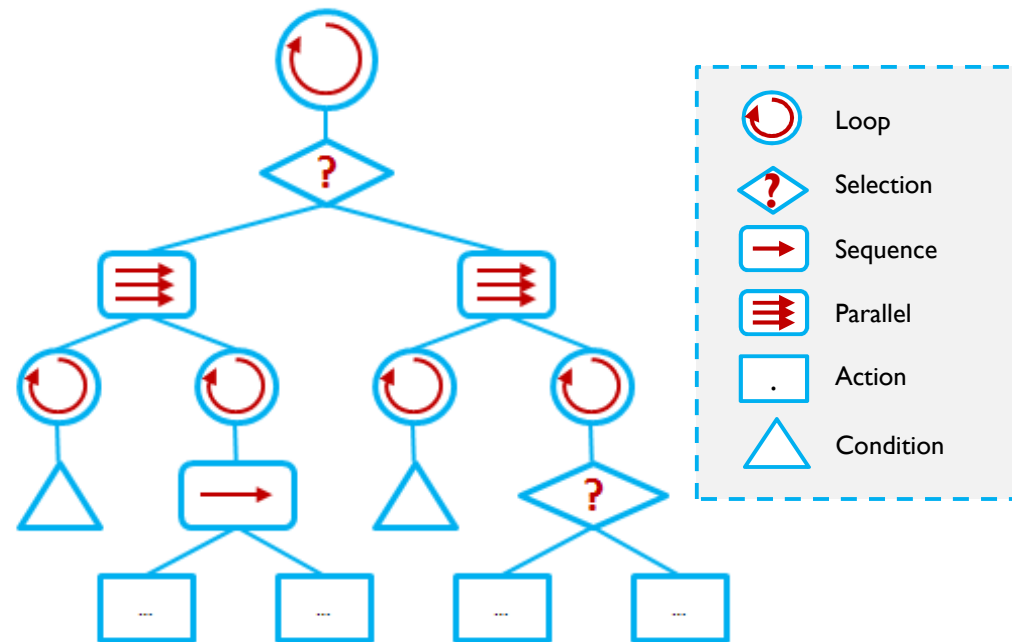
Behavior tree

► Features

- Goal directed
- Hierarchical abstraction



Editor



Tree


Tree Nodes

▶ Leaf nodes

 ▶ **Condition** - check state

 ▶ **Action** - actual command to execute

▶ Decorators

 ▶ **Loop** - in a constant loop

 ▶ **Selection** – check which one to run in priority order

 ▶ **Sequence** - execute children one by one in order

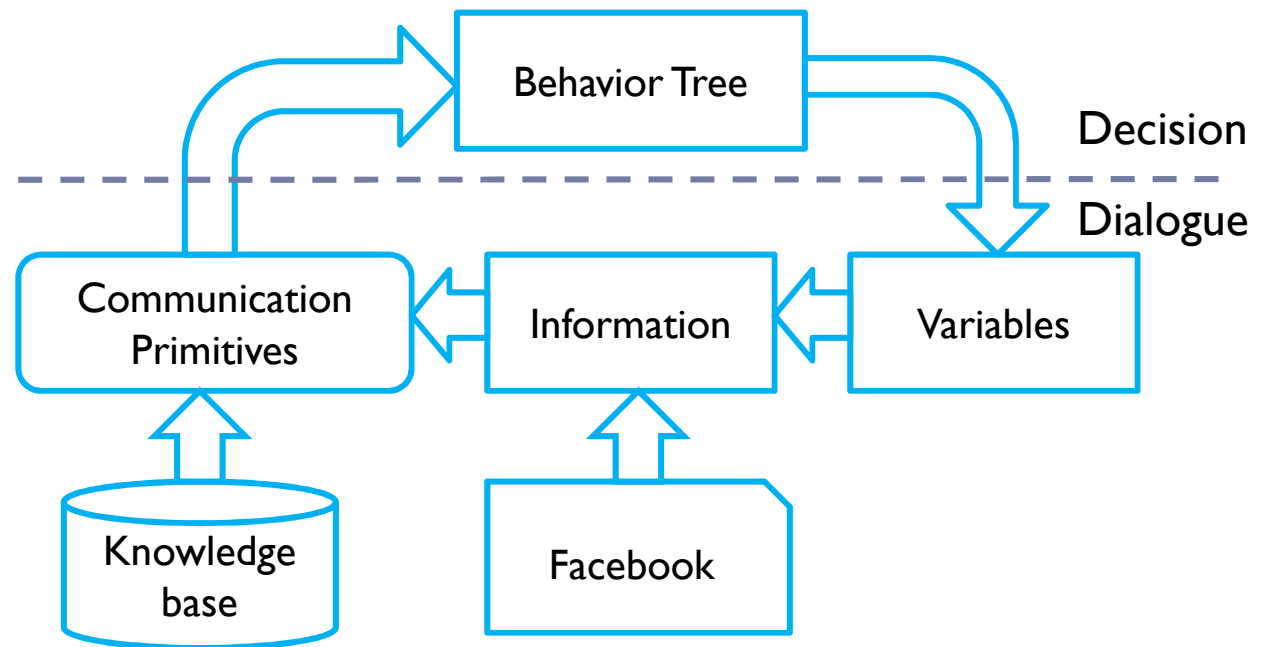
 ▶ **Parallel** - concurrency, visit all children

Complex behaviors



Dialogue planning

- ▶ Behavior tree
 - ▶ Planning the process of interaction
- ▶ Dialogue with Facebook
 - ▶ Variables
 - ▶ Targets
 - ▶ Contents
 - ▶ Information
 - ▶ Profile
 - ▶ Social networks
 - ▶ Emotion



Outline

- ▶ Motivations
- ▶ Background
- ▶ System overview
- ▶ Dialogue planning
- ▶ Information extraction
- ▶ **Experiments**



Experimental design (I)

▶ Experiment One

- ▶ Hypothesis: the ability for the virtual human to be aware of Facebook would enhance the virtual human-human interaction
- ▶ Approach
 - ▶ Between-group
 - ▶ Talking about movies
- ▶ Measurement
 - ▶ Evaluation of Sophie's performance : six 5-Likert scale questions
 - ▶ Evaluation of Sociability of Sophie: nine 5-Likert scale questions



Experimental design (II)

▶ Experiment Two

- ▶ Hypothesis: getting emotional and mood states of users can make virtual humans more sociable
- ▶ Approach
 - ▶ Between-group
 - ▶ Users keep posting message to Facebook, then meet with VH
 - ▶ A long-term field study
- ▶ Measurement
 - ▶ Evaluation of sociability of Sophie: nine 5-Likert scale questions



Q & A

THANK YOU

