Intelligent (Task-Oriented) Conversation Assistant for Course Selection

Progress Report



Information Technology Capstone Project

COMP5703

Group Members

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# Progress Status

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| **Project Name** | CS17 Intelligence(Task-Oriented) Conversation assistant for course selection |
| **Project Start Date** | 6/ 3/ 2019 |
| **Project Manager** | Biying Wang |

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| Project Description | The project focuses on using NLP and other technologies to build a dialog system to analyse and answer the questions that students ask in terms of course units on University of Sydney education system |

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| Project Status Report | # | Date:19/ 4/ 2019 |

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| **Status Item** | **Status up to last week** | **Planned for this week** |
| **Major deliverables** | A natural language generator demo | Intent design  Intent classification |
| **Planned delivery date** | 12/ 4/2019 | 19/ 4 /2019 |
| **Major issues** | Last week, our design is template based NLG,  And I review somw method, then use the open source code to design a structural NLG. | Even we have start coding the main part of the project.  One important point is the data and intent type. This week I work with other team member and design the intents |
| **Major risks** | 1, the NLG require some difficult method , mostly require a language model to support.  2, the machine learning method require the data set to support the training process. | 1, the first risk is when I design the intent, I think we need design the intent based on the CUSP data structure and other poinion is design the intent with the data base structure. |
| **External dependencies** | Slack, github | Slack, github |
| **Estimated effort (hr)** | 40hr | 20hr |
| **Recorded effort (hr)** | 40hr | 20hr |
| **Status (R, Y, G)** | yellow | green |

# Roles & Responsibilities

Shengyuan Sun

Role: developer

Responsibility:

* Design the intents
* modify the intent classification part

Rui Chen

Roles: Analyser and Developer

Responsibility:

* Analysing the general questions
* Dependency parsering general questions
* Visualize dependency tree and structural tree of general questons

Biying Wang

Role: Project Manager; Developer

Responsibility:

* Check weekly deliverables
* Check meeting time, location and meeting topic
* Discuss intent classification and slot filling with team members
* Design Entity list

Quan Chen

Role: Developer

Responsibility:

# Individual Achievements

This week, we deiscuss the intent and entity, and any issues which we need to finish in the future, the first question is the raw question. After two week work we still have not new idea for generate the raw queston set, then we decide to use the traditional method that the template based method,

Second the dialog state tracker part, currently we will use the stack to track the state in the dialog because the we lack the the topic-related dataset to train the machine learning model.

Third, the dialog management part, it is more about the knowledge base and descion maker. About the descion maker, we will use the handcraft rule to decide what rule and answer would send to user.

And apart from the meeting, I also modified the current intent classfiicaton model, and discussed the intent design with the members.

# Group Collaboration

图片包含 屏幕截图

描述已自动生成

图片包含 屏幕截图

描述已自动生成

# Summary

Week6

In this week, We start code the program based on our architrture.

The first task is determine the rule structure. The rule is simple like if A and B then C. so In our system, I design the rule if {slots} and {entity }then answer template and SQL.

The inforamtion tree, a big point is that the information tree is not the intent, the information tree is based on the CUSP data structure. The information tree is a map for intent to track the information is needed for related intent, when there is a intent changing, the information tree can help to track the intent.

The dialog tracker part, a dialog tracker have two functions, first one is store all information between the user and chatbot, the second function is to track back to the intent in the before this dialog.

The dialog management ia a system to integrate all part, a function is to manage how to deal with when intent changing and other condition happened.

The result is

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Week7

reviewed six method

The first one is the most simple one, this method is the template-based method, it requires pre-define a lot dialog template and rules, then mapping the rule and template and information to the natural language

The second method is the plan-based method, this method contains three phases, the first phase is sentence plan generator, at this phase the system will generate a sentence planning tree, each node of the tree represents a dialog action. Following the sentence plan ranker phase, To ensure that the output trees/strings correspond semantically to the input DA, we implemented a classifier to rerank outputs and penalize that missing required information and/or adding irrelevant one

Finally, surface realizer phase, it will transform the sentence plan tree to the sentence, the transform process integrates all the child node to the parent node

The third method is the class-based method, this method generates the sentence based on the language model generally an n-gram language model, the requirement of the class-based method is you need defined the different class and separately compute the probability of each class, and Finally take the maximum probability of class

The phrase-based method also used a language model generally an n-gram language model, the benefit is it more efficiency and more accuracy, the disadvantage is it requires more semantic alignment and semantic stack

The fourth one is RNN-based language model method a neural network based NLG system that can be fully trained from dia1og action to utterance pairs without any semantic alignments between the two.

The next one is structural NLG this method uses the syntax tree plus neural network，encode trees as sequences，then apply seq2seq to generate the sentence. The encoder is an Lstm and decoder is an Lstm with softmax and implemented a simple beam search for decoding It proceeds left-to-right and keeps track of log probabilities of top n possible output sequences, expanding them one token at a time.

Finally implemented a classifier to rerank outputs and penalize that missing required information and/or adding irrelevant one.

The last one is contextual NLG, this method also a seq2seq model，improve structural NLG with a context-aware part，The advantage is that the generated response will consider the context and is more suitable for multiple rounds of dialogue

Seq2seq2 model design

The seq2seq generator starts with the encoder stage, which uses an RNN to encode an input sequence into a sequence of encoder outputs and hidden states, a non-linear function represented by the long-short-term memory (LSTM) Cell

The decoder stage then uses the hidden states to generate a sequence with a second LSTM-based RNN. The probability of each

output token is defined with softmax.

the decoder is initialized by the last hidden state and uses the previous output token at each step.

# Peer Revi

