

Relation management for machine socialization

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Abstract— This paper presents relation management for machine socialization. Machine socialization is making thing or machines to talk to and say what they do or need to each other follow each other, discuss with each other and collaborate with each other. Relation is an association between or among object capability within machine enabling to share or provide capability to achieve the task in collaboration. Relation includes scheduling of process between or among machines during performing the task. This paper also presents relation models for machine socialization.

Keywords— machine socialization, relation, models, capability, machines

I. INTRODUCTION

This paper presents what is machine socialization and what is relation management for machine socialization. Relation model which is most important part of relation management also presented. Schema which is related with relation model is also presented in this paper.

II. CONCEPTS OF MACHINE SOCIALIZATION

Socialization may have many means and one of the important feature of socialization is working together with each other. Machine socialization implicates that machines work together each other to complete the command coming from human. Machine socialization is defined at the developing ITU-T recommendation such as that Machine socialization is making thing or machines to talk to and say what they do or need to each other follow each other, discuss with each other and collaborate with each other.

Human can exchange his ideas with other people by using language or gesture but machine cannot exchange information with other machines by using natural language directly. Machine can exchange information which can be expressed by digital data with each other. Machine can respond to other machines by analysis the digital data which is received from other machines.

Machine socialization can be realized by making relation among the machines. Relation is an association between or among object capability within machine enabling to share or provide capability to achieve the task in collaboration. Relation includes scheduling of process between or among machines during performing the task.

To make relation, each machine can understand the meaning of data coming from other machines. By using that data, machine should identify other machine's status, capabilities and other information about machines. By

exchange the data about itself in mutually understandable form, machines can make relation with other machines. Making relation, operation according to the relation and release the relation of each machines is essential part of machine socialization.

III. RELATION MANAGEMENT

A. Relation

For machine socialization, we have to make relation among the machines by using data which is exchanged among the machines. The tasks which is needed to complete the commands from human will be processed according to the relation. The relation will be released after all the task is done. Therefore, making relation among machines is first step for machine socialization and releasing the relation is last step to end machine socialization.

B. Relation management

For machine socialization, we have to manage the relation among the machine. The methods to manage relation are may be different according to the relation models. Relation models show overall structure to manage the relation among the machines. We present three models for the relation management of machine socialization.

C. Relation Models

We present three relation models for relation management of machine socialization.

1) Centralized Relation model: Centralized model has one relation server and may have a large number of machines which is connected to it by network.

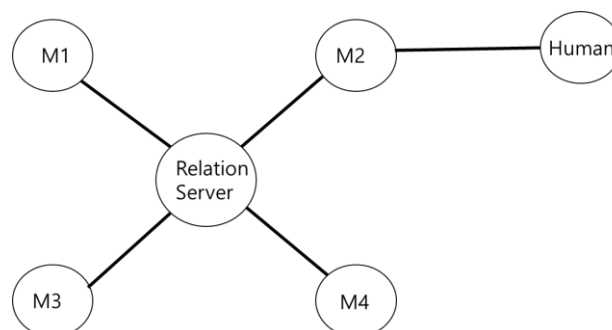


Figure 1. Centralized relation model for machine socialization

In Figure 1, relation server manage the relation among the machines. Relation server manages relation according to the following steps.

- Analyse the commands coming from human.
- Make capability set to complete the command.
- Grouping the useable machines to execute the command on the based machine profile parameter of machines which are registered to relation server or communicable with relation server.
- Make the execution order of grouped machines according to the machine parameter and status parameter of those machines.
- Relation server makes work profile parameter according to the relation.
- Operate grouped machines according to the execution order which is listed in work profile parameter.
- After completion the commands from human, relation server release the relation and erase work profile parameter.

2) Distributed relation model: In this model, relation is established via distributed machine without server.

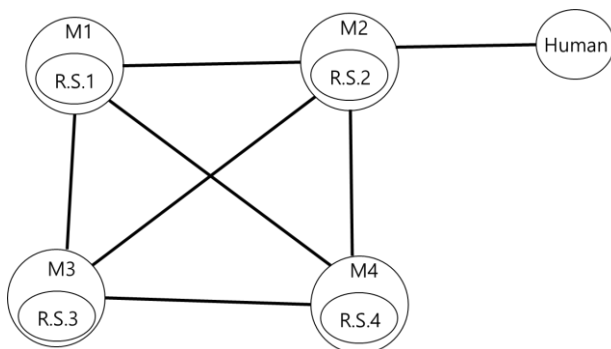


Figure 2. Distributed relation model for machine socialization

In this model, every machine can join to the relation and disjoin from the relation without intervention of server. In this model centralized relation server doesn't exist. Every machines should determine whether join or doesn't join to the relation for execution commands coming from human when the commands arrived to itself. Every machine has relation module (R.M.) to manage relation. Relation module determine whether join or not to the current relation and when operate the machine.

In this model, the commands coming from human will be arrived every machines. Relation module analyse and manages the relation for execution human commands. Relation module which is located every machine manages relation according to the following steps.

- Relation module accept the commends coming from human and analyse it
- Relation module make capability set to execute the command and compare it with its own capability parameter.

- If relation module find that its own capability and status can be useable to execute the command coming from human, relation module join the relation and notify it to the other machines.
- Machines which are joined to the relation make a group to process the commands coming from human.
- Grouped machine will be operated according to the relation that is based on capability parameter and status parameter of machines and saved to the work profile parameter.
- Grouped machines will be operated according to the execution order which is listed in work profile parameter.
- After completion its own tasks, each machine release the relation and erase work profile parameter.
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3) Hybrid relation model: The hybrid relation model is a composite model of centralized model and distributed model. Hybrid relation model combined merits of centralized relation model and distributed relation model.

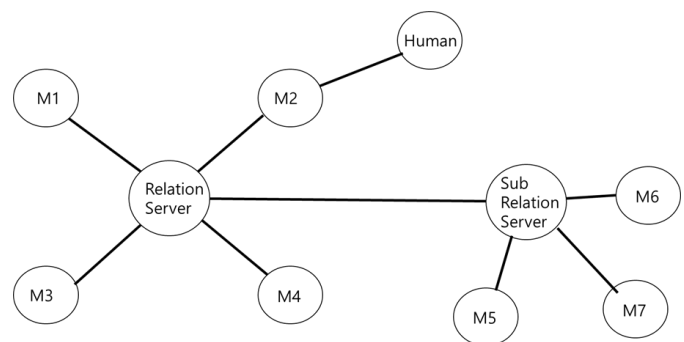


Figure 3. Hybrid relation model for machine socialization

Hybrid model can be extended more easily than the two models. Hybrid model has relation server and sub-relation server. Sub-relation which is generated by sub-relation server can be used by relation server when it generating a relation. In other words, sub-relation can be inherited to relation server.

Hybrid relation server manage the relation as following steps.

- The relation server analyse the commands from human.
- The relation server make capability set to execute the command by using internal DB and connected machine's profile and machines profile which is connected sub relation server.
- The relation server grouping the useable machines to execute the command on the based capability parameter and status parameter of machines which are registered to relation server or communicable with relation server or machines which is connected to sub-relation server.
- The relation server makes the execution order of grouped machines according to the capability parameter, sub-relation and status parameter of those machines

- The relation server makes work profile parameter according to the relation and sub-relation.
- The relation server operate grouped machines according to the execution order which is listed in work profile parameter.
- After completion the commands from human, relation server release the relation and erase work profile parameter. Sub-relation server also release the sub-relation.

IV. SCHEMA FOR MACHINE SOCIALIZATION

Relation server or relation module needs exchange of information with machines, processing of that information and save the result to somewhere to make relation. Schema is like a database format for saving information. Therefore, schema is needed to save information related the relation so that the relation server or relation module can manage the relation. We defined two types of schema. One is machine profile schema and the other is work profile schema.

Machine profile parameters can be saved to the machine profile schema and work profile parameter can be saved to the work profile schema.

A. Machine Profile Schema

Machine profile schema is ready for machine profile parameter and its sub parameter. Machine profile parameter describe the characteristics of machine. That indicate the status of machine, capabilities of machine, machine ID and user group ID etc..

TABLE 1. MACHINE PROFILE SCHEMA

Machine profile parameter	Sub parameter
Status	Active
	Standby
	Expected ending time of current operation
	Current execution task
	Current execution function
	Expected ending time of current execution function
capability	Name of task
	Input parameter
	Output parameter
	Processing time
	Processing condition
	Function 1
	Function 2
	
	Function n
	End of function
Machine ID	
User ID	
Group ID	

Machine profile parameter	Sub parameter
Operating system	
Machine interface	Interface protocol between machine
	Interface parameter between machine
	Interface protocol between machine and relation server
	Interface parameter between machine and relation server
End of machine profile parameter	

B. Work Profile Schema

Work profile schema is ready for work profile parameter and its sub parameter.

TABLE 2. WORK PROFILE SCHEMA

Work profile parameter	Sub parameter
Capability set	Capability 1
	...
	Capability n
	End of capability set
Grouped machines	Machine ID 1
	
	Machine ID n
	End of machine ID
Work group ID	
Work description	
Task processing schedule	Task 1
	Start time
	Start condition
	Allotted machine ID
	Start time of operation
	Functions 1
	
	Function n
	End of functions
	Expected time of ending
	Interface parameters
	Ending condition
	End of task 1
	Task 2
	Start time
	Start condition
	Allotted machine ID
	Start time of operation
	Function 1
	...
	Function n
	End of Functions

	Expected time of ending
	Interface parameters
	Ending condition
	End of task 2
	
	Task n
	Start time
	Start condition
	Allotted machine ID
	Start time of operation
	Function 1
	...
	Function n
	End of Functions
	Expected time of ending
	Interface parameters
	Ending condition
	End of task n
	End of Task processing schedule
End of work profile parameter	

V. USE CASE OF MACHINE SOCIALIZATION BY USING CENTRALIZED RELATION MODEL

A. Booking of a movie ticket based on centralized relation management model

This use case indicates booking of a movie ticket based on centralized relation model for machine socialization. This use case illustrates processes to make relation between machines and to analyse the given task in a relation server.

To explain this use case, we use Figure 1.

Each machines of Figure 1 are defined as follows.

M1: movie search engine that has communication function.

M2: smart phone

M3: machine that has movie reservation function and communication function.

M4: boiler control device that has communication function

Each machine has following capabilities.

M1: M1 can search movie and has communication function with relation server.

M2: M2 can receive commands from human. It can receive the commands by using e-mail, SNS or messenger. It can transfer the commands which is coming from human to the relation server. M1 has communication function with relation server.

M3: M3 can make reservation of selected movie and has communication function with relation server.

M4: M4 can control internal temperature of house and it can communicate with relation server. This machine is needed to provide a service to satisfy the human. This machine can control the temperature of the house while the human is watching a movie at a theatre.

1) Relation is made by following procedure.

M2 transfer the commands coming from human to relation server.

The relation server analyse the received command and make capability set to execute the command according to the analysis result. In other words, relation server analyse the human command and machine profiles and make work profile to execute the human command.

Machine profile can contain capability parameter and status parameter of machine.

Machine profiles can be stored in the relation server or can be transferred to relation server from the machines.

The work profile which is generated by relation server contained grouped machines, start/end time of that machines and task procedure.

The relation server can grouping machines which can be used to execute the command by using machine profiles and the generated capability set.

The relation server can operate every machine by using work profile.

Everything about relation is saved to work profile

2) Commands which is coming from human should be processed as following procedure.

M2 transfer the commands coming from human to relation server.

The relation server make relation and work profile.

The relation server operate grouped machines according to the work profile.

The relation server sends commands to M1 to search specified movie.

The search result transmitted to relation server.

The relation server sends the search result to human by way of M2.

Human can select a movie and that information is transmitted to relation server by way of M2.

The relation server analyse the human response and if it is needed to make reservation a movie, then the relation server sends reservation command to M3 with related data.

M3 make a reservation and confirm it with human by way of relation server and M2.

The relation server can activate M4 while human is watching a movie according to the work profile.

The relation which is made by relation server will be released after the completion of command from human.

The work profile also will be erased after the completion of command from human.

3) The procedure of making relation and providing machine socialization service by centralized model

The procedure of making relation and providing machine socialization service by centralized model is illustrated by Figure 4 to understand more easily about making relation and procedure of machine socialization service.

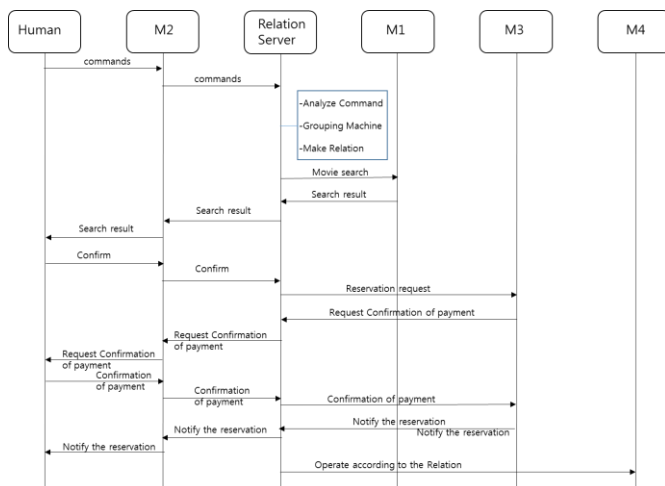


Figure 4. The procedure of making relation and providing machine socialization services by centralized relation model.

The human sends commands to M2.

M2 sends human command to relation server.

Then, relation server analyse command, grouping machine and making relation.

According to the relation, relation server sends movie search command to M1.

M1 search movies by using received data from relation server.

M1 sends search result to the human by way of relation server and M2.

Human select and confirm a movie.

Relation server request reservation to M3 according to the relation.

M3 initiate movie reservation and payment process and then confirmation request to the human by way of relation server and M2.

After receiving confirmation of payment from human, M3 make a reservation and pay the movie ticket and then M3 notify the result to the human by way of relation server and M2.

Relation server operate M4 according to the relation.

After completion of command coming from human, relation server release the relation.

VI. CONCLUSIONS

In this paper, we invented the concepts of machine socialization and relation models. We present three relation models for machine socialization and schema for relation models. We present two kinds of schema for machine socialization. One is machine profile schema and the other is work profile schema. By using relation models and schema for machine socialization, we can develop a system for machine socialization easily.

ACKNOWLEDGMENT

This work was supported by ICT R&D program of **MSIP/IITP**. [R0166-15-1001, Standards Development for Machine Socialization]

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