

# IKGRC2024: 2<sup>nd</sup> International Knowledge Graph Reasoning Challenge

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# Today's Program



## IKGRC Workshop (I) 14:25-15:35 (Chair: Kouji Kozaki)

Place: Crystal 2 + [Parallel Virtual Room](#)

14:25-14:35 Opening

14:35-14:55 Introduction

14:55-15:15 Zero-Shot Query Experiments in Knowledge Graph Reasoning Challenge for Older Adults Safety

Ken Fukuda, Takanori Ugai, Shusaku Egami, Kyoumoto Matsushita

15:15-15:35 Event Prediction in Event-Centric Knowledge Graph Using BERT

Takanori Ugai, Shusaku Egami, Ken Fukuda

## IKGRC Workshop (II) 16:00-17:00 (Chair: Takanori Ugai)

Place: Crystal Ballroom + [Virtual Room](#)

16:00-16:10 Introduction

16:10-16:30 Prediction of Actions and Objects through Video Analysis Using Stepwise Prompt

Tsukasa Hirano, Kengo Ozaki, Takeshi Morita

16:30-16:50 Prediction of actions and places by the time series recognition from images with Multimodal LLM

Tomohiro Ogawa, Kango Yoshioka, Ken Fukuda, Takeshi Morita

16:50-17:00 Closing

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# Introduction Dataset and Tasks

2024/02/07

Takanori Ugai<sub>(1,2)</sub>

(1) National Institute of Advanced Industrial Science and Technology

(2) Fujitsu Limited

# Objectives of this Challenge,



- With the recent increase in interest in artificial intelligence (AI) technology triggered by Deep Learning, AI technology is expected to become widespread and embedded in various social systems.
- This contest aims to share, develop and promote necessary technologies for reasoning or predicting using artificial intelligence techniques.
- IKGRC2023: 1st Knowledge Graph Reasoning Challenge
  - The challenge aimed to promote techniques for explainable AI using knowledge graphs.
  - The task was to identify the culprits with a reasonable explanation using a dataset of knowledge graphs representing eight Sherlock Holmes mystery stories.
- IKGRC2024: 2nd Knowledge Graph Reasoning Challenge
  - The challenge aims to develop AI to support safety in the home in an aging society
  - The task of this challenge is to collect information using multimodal data with movies and knowledge graphs to understand the behavior in the home.

# Unique Multimodal Data

- Information of interaction between the event sequence expressing the avatar's behavior in the virtual space and the accompanying environment correspondently.

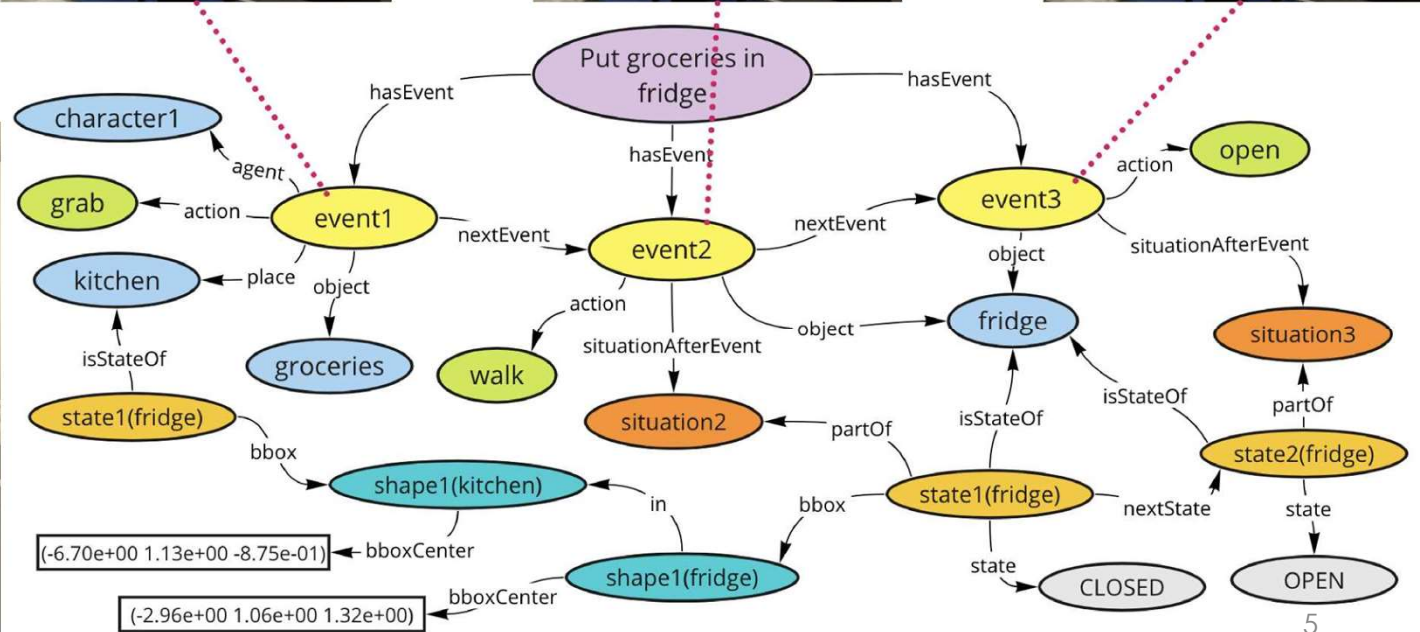
[GRAB] <groceries> (169)



[WALK] <fridge> (152)



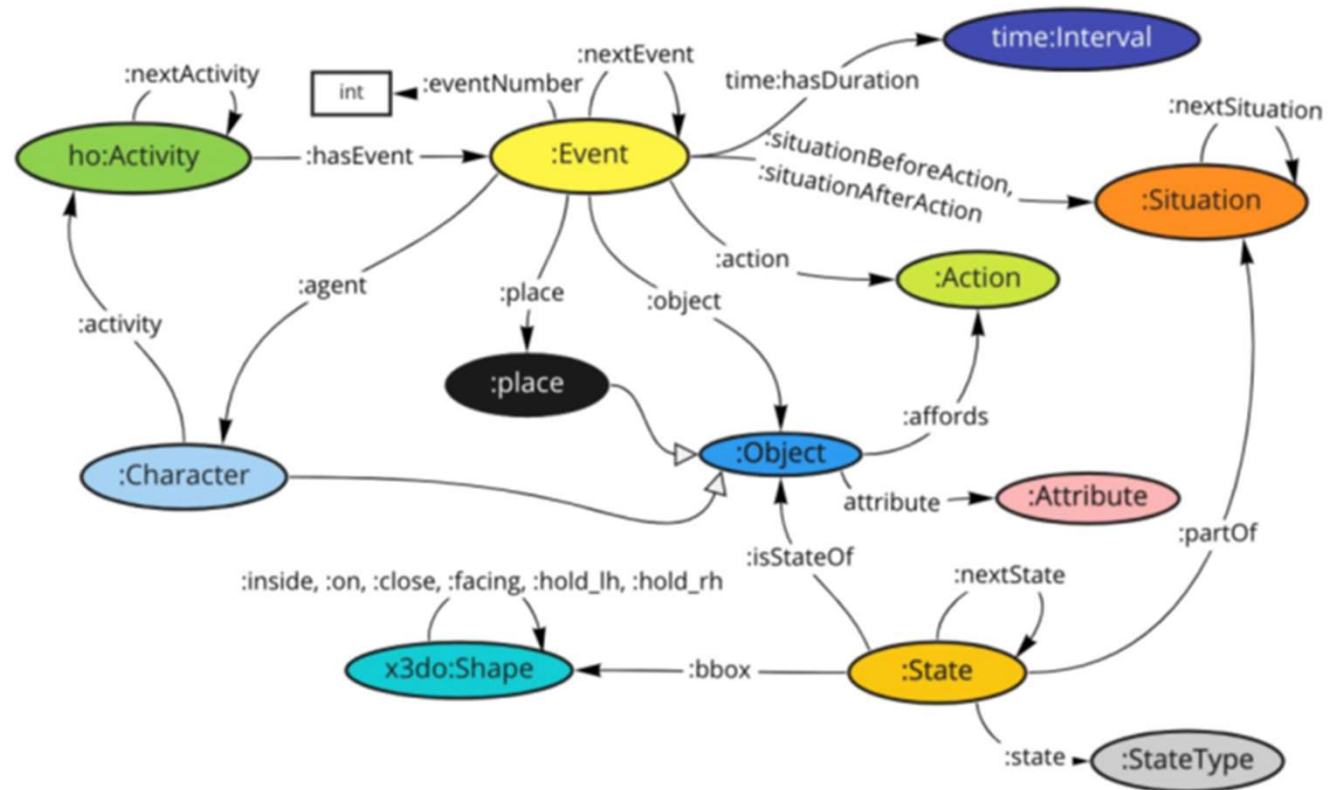
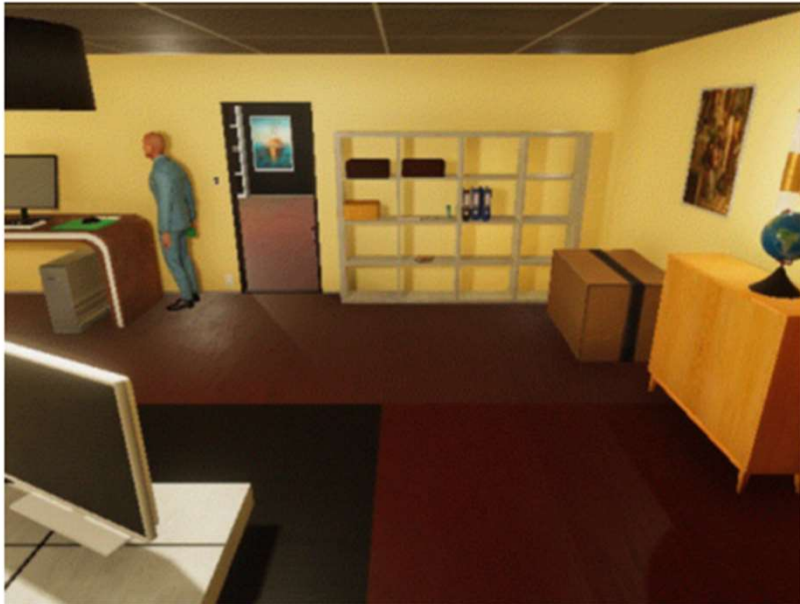
[OPEN] <fridge> (152)



## DKI







# Outline of Data set



- Movie
  - Mp4 format
  - 706 scenarios: 3530 movies
  - Minimum 1 to maximum 7 patterns of data per action scenario with different room layouts (scenes)
  - Scene graph data in the data format provided by ActionGenome
- [Knowledge Graph](#)
  - RDF format (TTL & N-TRIPLE)
  - 706 knowledge graphs corresponding to scenarios
  - N-TRIPLE is expected to be used for graph neural network and knowledge graph embedding
- Script
  - Text format
  - Original data for generating videos and knowledge graphs
  - Includes titles of actions and brief text descriptions



# Example of Scenario



- Eat cupcake1

Title

- After completing the personal hygiene routine in the bathroom, a person walks through the bedroom to reach the kitchen. Once in the kitchen, the person walks over to the cupcake and grabs it. Then, walks and enters the living room and sits on the sofa. The person starts eating the cupcake. Enjoying a slice of the cupcake as a snack or a quick bite for breakfast can provide a simple and convenient way to start the day or satisfy hunger between meals, although it's worth noting that cupcakes are typically considered more of a dessert or treat rather than a traditional breakfast item.

Description

- [WALK] <bedroom> (1)
- [WALK] <kitchen> (1)
- [WALK] <cupcake> (1)
- [GRAB] <cupcake> (1)
- [WALK] <livingroom> (1)
- [WALK] <sofa> (1)
- [SIT] <sofa> (1)
- [EAT] <cupcake> (1)

Script

# Challenge Task



- Task 1: Measure actions from a complete knowledge graph or scene graph
  - Answer Q1 to Q8 for each episode provided in the episode list.
  - An episode is a sequence of one to seven activities (scenarios).
  - The format for each answer is provided in JSON.
- Task 2: Measure actions from an incomplete knowledge graph or scene graph
  - Same as Task 1, answer Q1 to Q8 for each scenario provided.

# Questions



Q1: How many times did he enter each room?

Q2: How many times did he perform each action?

Q3: What action did he take after entering the kitchen?

Q4: What action did he take before entering the kitchen for the first time?

Q5: When, where, and what did he pick up?

Q6: What is he doing 10 seconds after the start?

Q7: Extract the relationship between objects at the initial state and after 10 seconds.

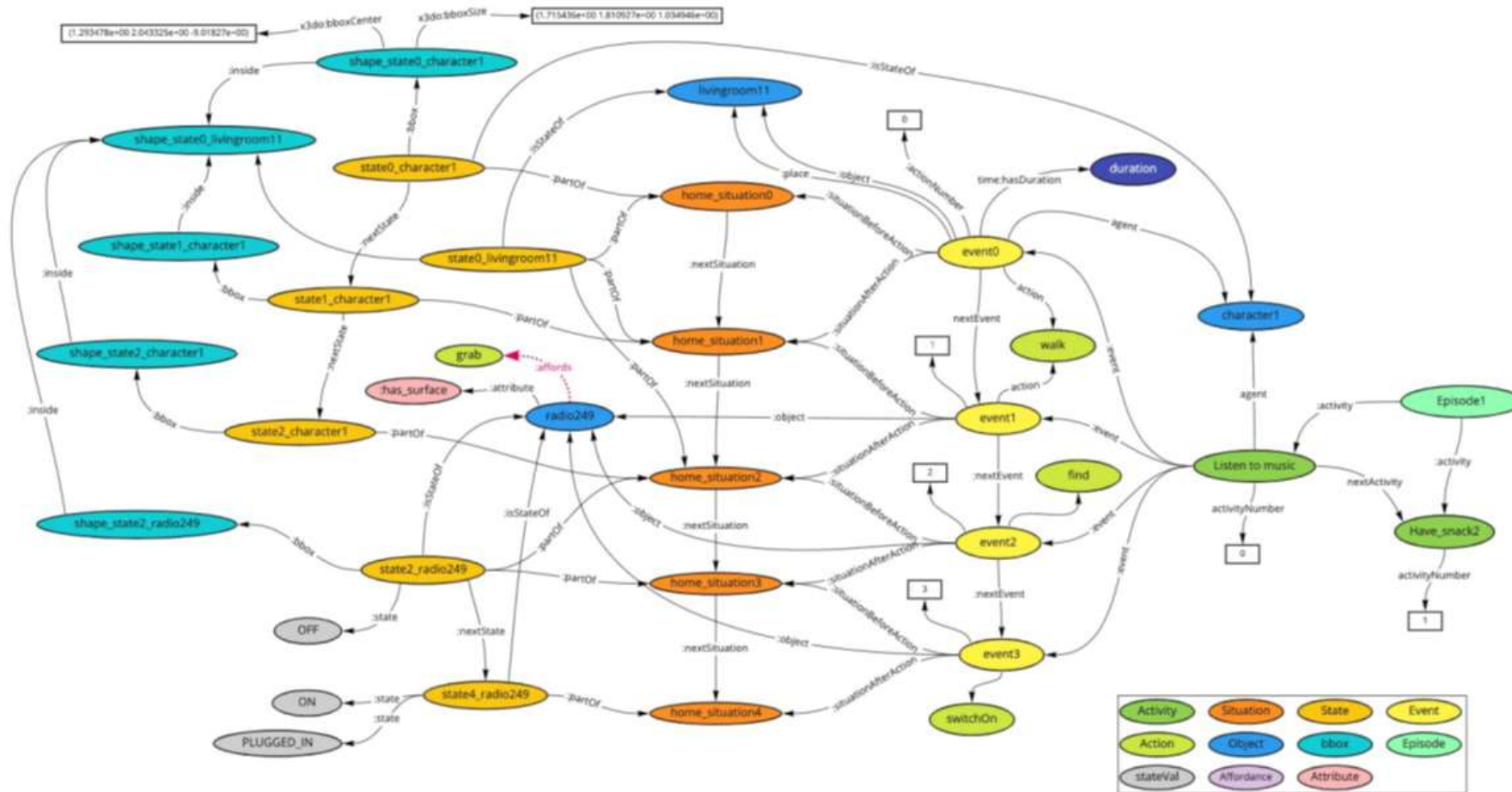
Q8: Extract changes in the state of objects from the initial state to 20 seconds later.

# Incomplete Knowledge Graph

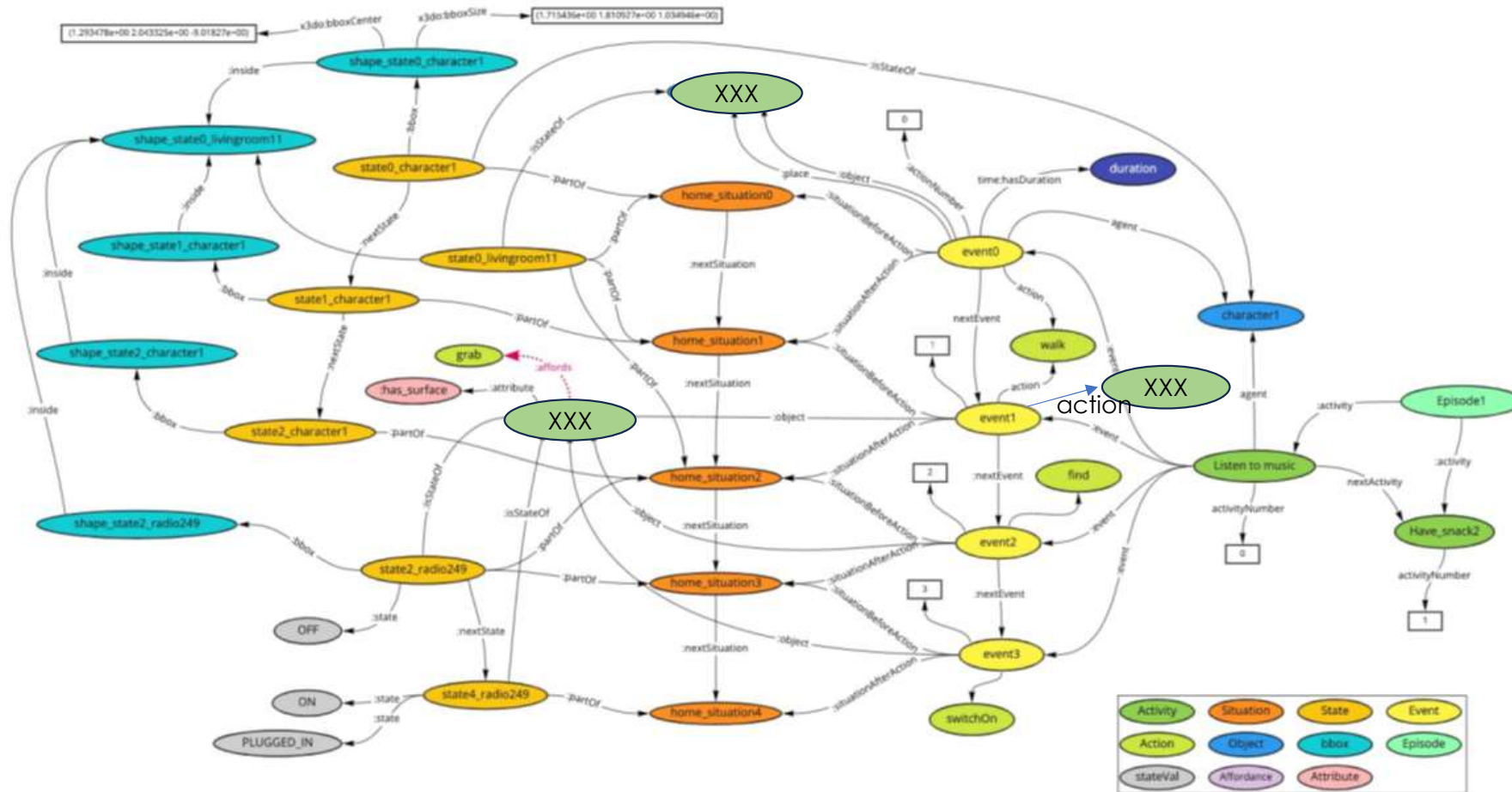


- Pattern1 : Places are covered.
  - Three variations of rate of coverage: 20%, 50%, and 100%
  - Covered places where the avatar is
- Pattern2: Adding to Pattern1, Actions are covered
  - Three variations of rate of coverage: 20%, 50%, and 100%
  - Covered actions that the avatar is doing
- Pattern3: Adding to Pattern2, Objects are covered
  - Three variations of rate of coverage: 20%, 50%, and 100%
  - Covered object that the avatar is doing something with
  - Only objects involved in the operation are covered, not objects placed in the room.

# Example of Cover



# Example of Cover





# Event Schedule



- 2023/11/24: Data has been opened, and submission has started.
- 2024/12/25: Submission deadline
- 2024/1/22: Material for preview deadline
- 2024/2/7(Today): Final Presentation
- The award will be announced in March.

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Ken Fukuda, Takanori Ugai, Shusaku Egami, Kyoumoto Matsushita

14:50-15:10 Event Prediction in Event-Centric Knowledge Graph Using BERT

Takanori Ugai, Shusaku Egami, Ken Fukuda

## IKGRC Workshop (II) 15:35-16:35 (Chair: Takanori Ugai)

Place: Crystal Ballroom + [Virtual Room](#)

15:35-15:45 Challenge Overview

15:45-16:05 Prediction of Actions and Objects through Video Analysis Using Stepwise Prompt

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16:05-16:25 Prediction of actions and places by the time series recognition from images with Multimodal LLM

Tomohiro Ogawa, Kango Yoshioka, Ken Fukuda, Takeshi Morita

16:25-16:35 Closing