The Gazebo - USARSim Interface
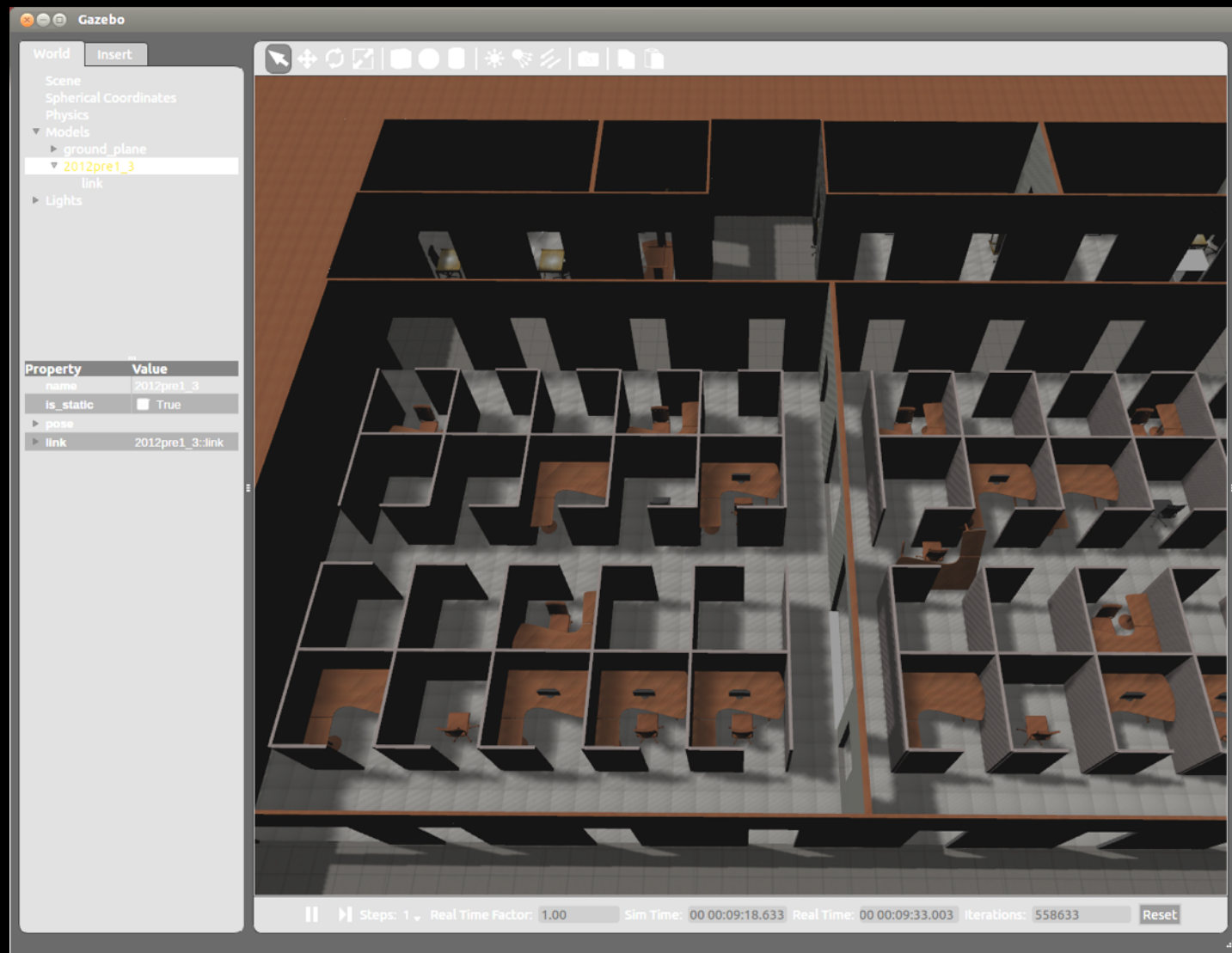

Masaru Shimizu
(Chukyo University, Japan)

A member of Technical
Committee of Rescue Virtual
Robot League
(2015~2017)
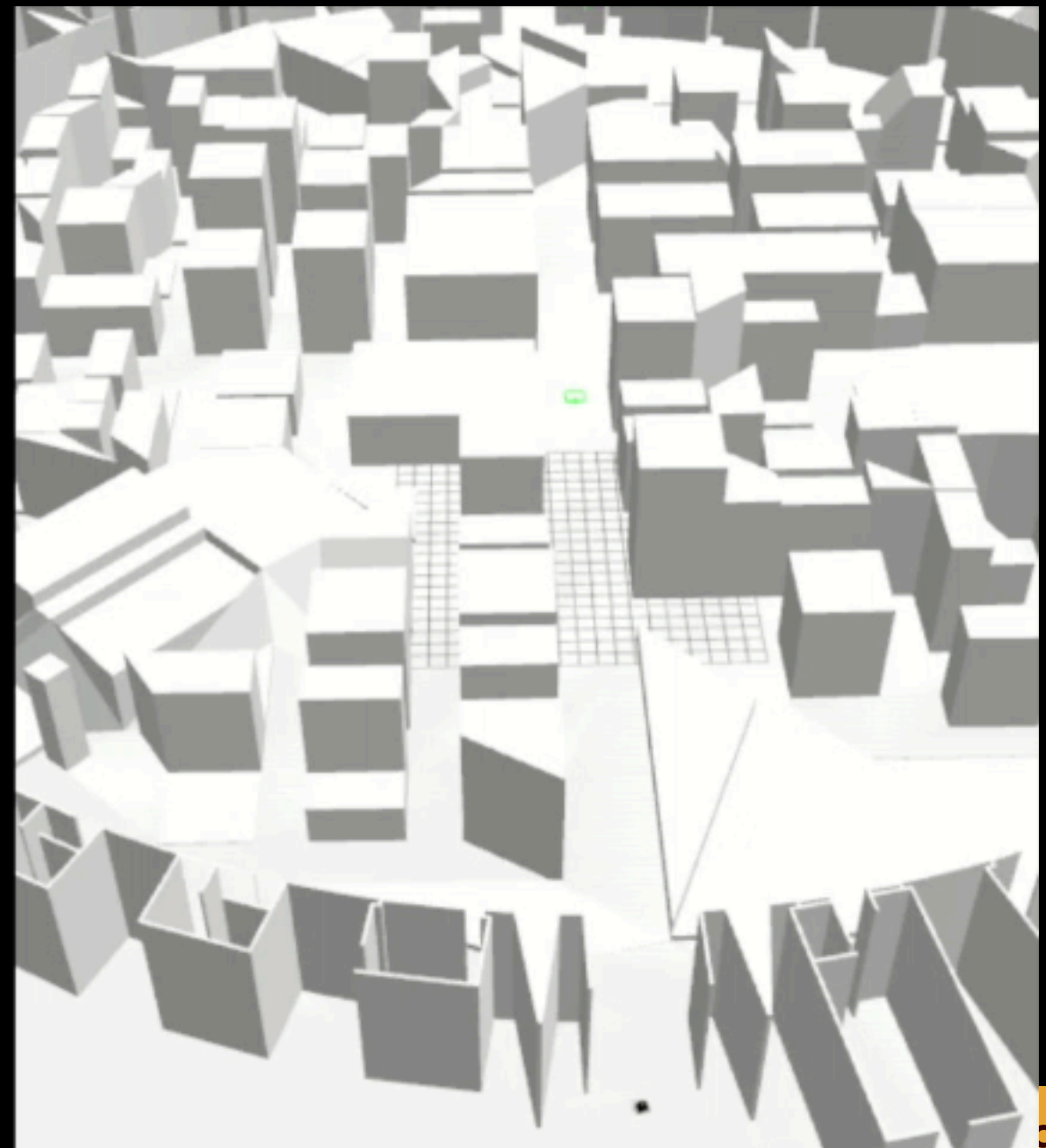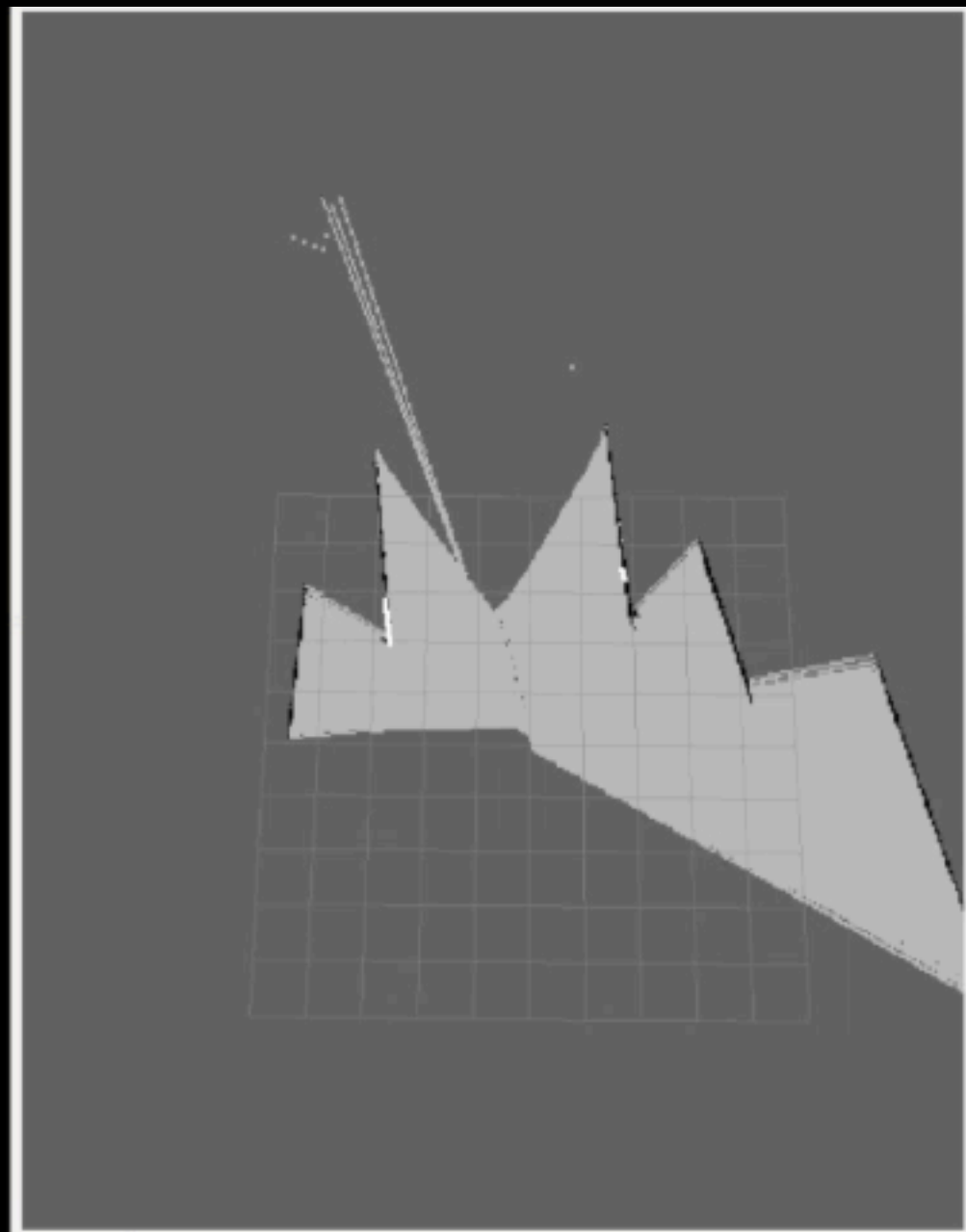
Overview of The Gazebo-USARSim Interface

- Show a short videos

  - RoboCup2012 Rescue Virtual Robot League Preliminary1 model and pioneer3at_wtih_sensors making SLAM map

Overview of The Gazebo-USARSim Interface

- Show a short videos
  - Portmessa Nagoya model and pioneer3at_wtih_sensors making SLAM map

Overview of The Gazebo-USARSim Interface

- Show a short videos
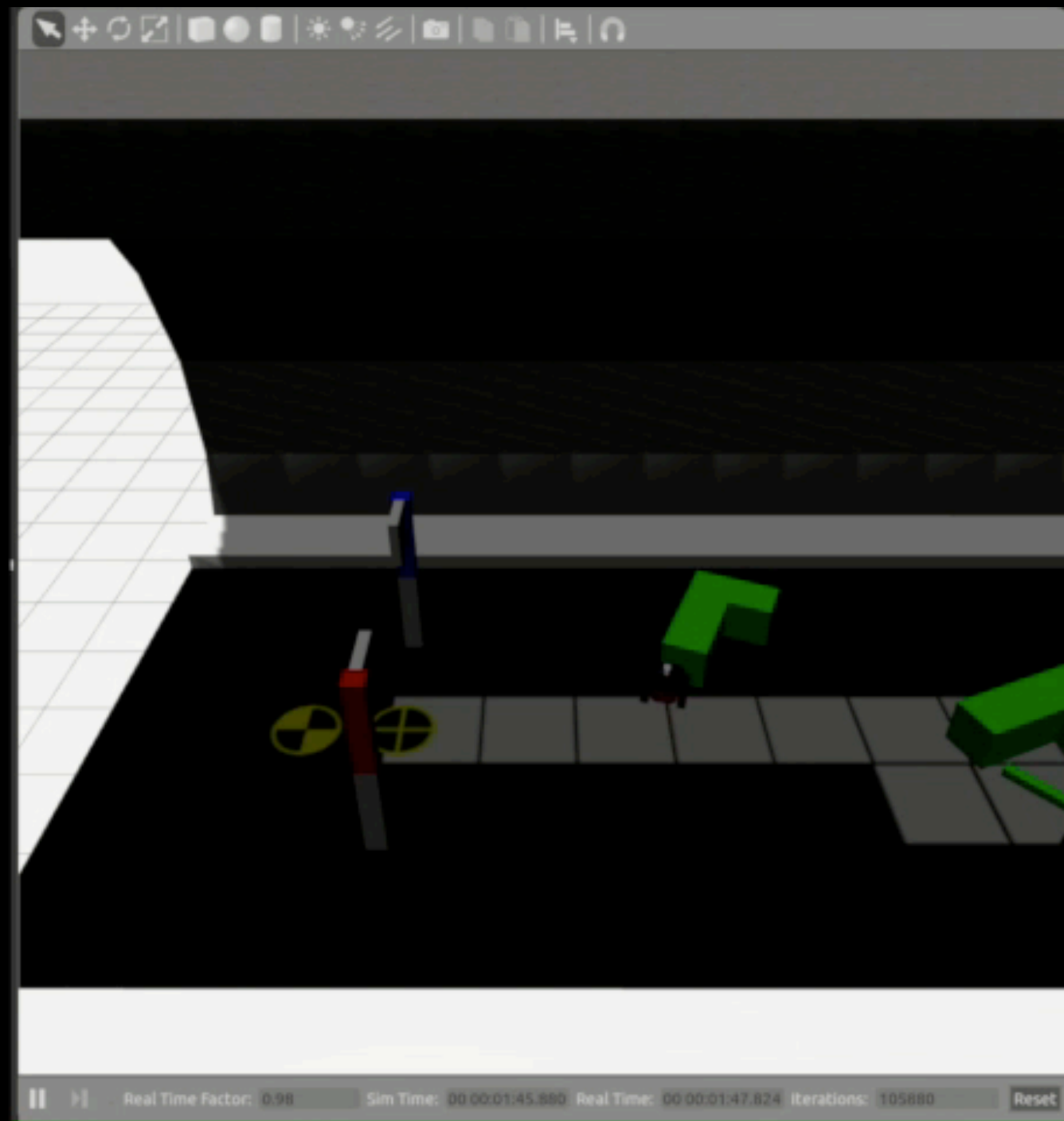 - JVRC_R4 model and pioneer3at_wtih_sensors pushing object

Overview of The Gazebo-USARSim Interface

- Show a short videos

  - JVRC_R4 model and pioneer3at_wtih_sensors making SLAM map

Overview of The Gazebo-USARSim Interface

- A figure of a simple system diagram
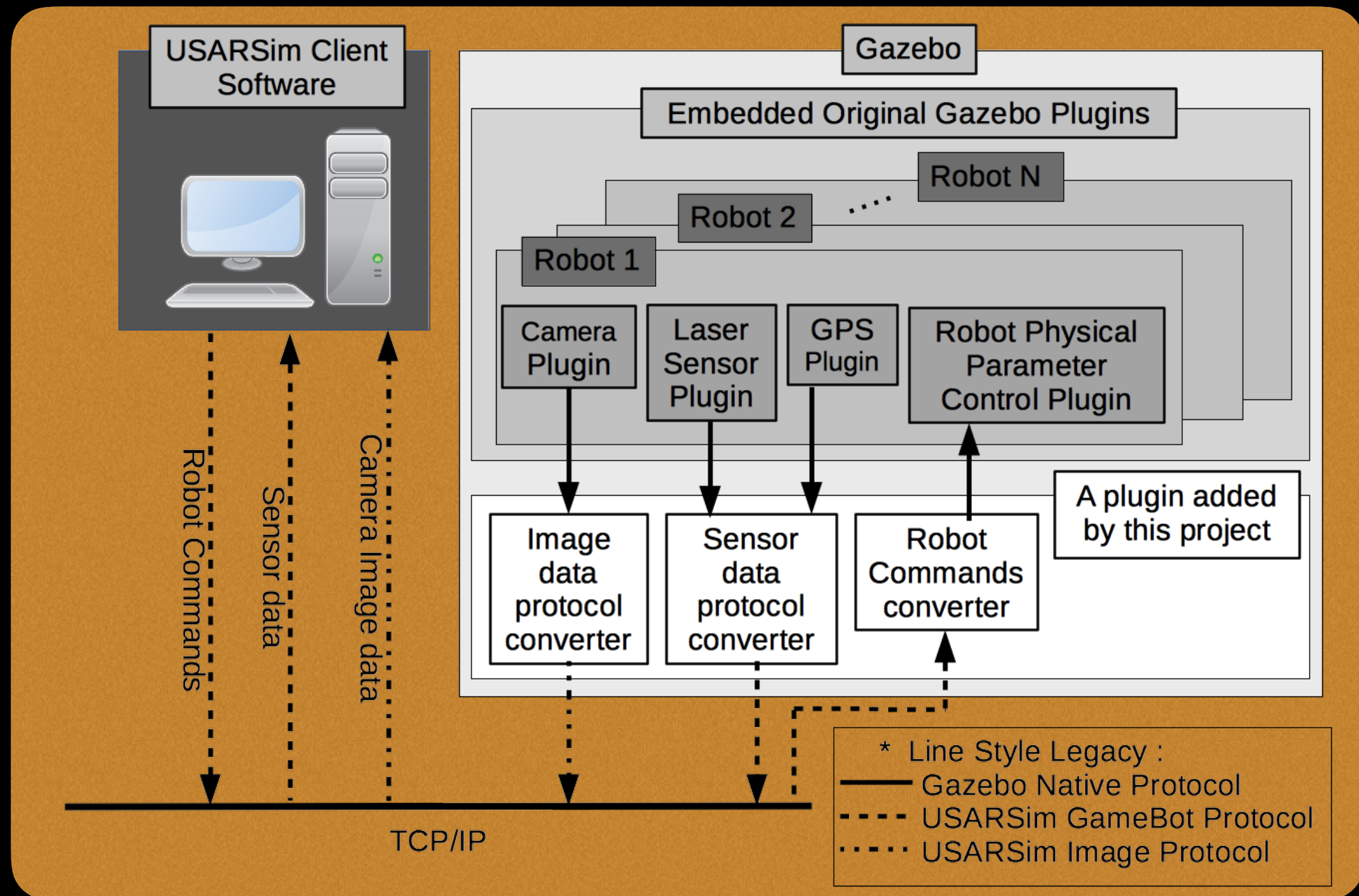
Why do we need Gazebo based simulation platform?

- We want to get a physics calculation results which we can use it for research activity.
  - We could not get it from USARSim.

- Now Gazebo is getting be a major tool for robotics researchers by it's many good characteristic points :
  - Gazebo has some changeable high-accuracy physics engine.
  - Gazebo has many robot models which have right physical models.
  - Gazebo has high connectivity with ROS

Why do we need Gazebo based simulation platform?

- For the RoboCup Rescue Virtual Robot League…..

- Almost of all teams want to use their own client software which they made.

  Then ……

- We need a connectivity between a client software for USARSim and the new Gazebo based platform.

- If someone write a software like a protocol convertor from Gazebo interface into USASim interface, teams can use their own client software which they made for USARSim.

- A T.C. of this league tried to make a prototype software for it.

- In this presentation, the software is called as "USARGazebo".

8

Description of New Simulation Platform [overview]

- Description of new simulation platform is consist of 2 parts.

    - Part1 shows the new simulation platform with Gazebo.

    - Part2 shows the new models for robotics researchers the new simulation platform with Gazebo.

Description of New Simulation Platform [Part1]

- What we need to realize new simulation platform with Gazebo?
  - We need a protocol convertor
    - Gazebo   :   Topics

                                                    ↑   ↓

                                         A PROTOCOL
                                         CONVERTOR

                                                    ↑   ↓

    - Each team's USARSim client software :   GameBot Protocol

Description of New Simulation Platform [Part1]

- How can we build the protocol converter?

- By using a plugin system of Gazebo.
    - In a Gazebo plugin, we can read and write Gazebo topics naturally.
    - For reading topics from sensors, we can register a call-back function with a Gazebo topic from a sensor.
        - We can construct some functions for input and output GameBot protocol with the ordinary TCP/IP socket API.
    - Writing Gazebo topics can be everywhere.
        - We can write a Gazebo topic, after receiving a USARSim command in GameBot protocol by TCP/IP socket.

Description of New Simulation Platform [Part1]

- What USARSim commands do we have to implement in the new simulation platform?

  - GETSTARTPOSES,

  - INIT

  - DRIVE

  - GETGEO

  - GETCONF

  - SET

Description of New Simulation Platform [Part1]

- What sensors do we have to implement in the new simulation platform?

  - CAMERA

  - LASER SCANNER

  - GROUNDTRUTH

  - ODOMETRY

  - GPS

  - INS

Description of New Simulation Platform [Part2]

- Reusability : RoboCup2012 RVRL Preliminary 1
  - Show a demonstration or a short video of using the model.

Description of New Simulation Platform [Part2]

- New models for research use : JVRC task models, Portmessa Nagoya RoboCup WCS 2017 venue model

  - JVRC task models, show a demonstration or a short video of using JVRC_R4 model.

  - Portmessa Nagoya model, show a demonstration or a short video of using the model.

  - Details of these introduced models will be showed tomorrow by Prof. Takahashi.

- JVRC_task_R4 from JVRC task models
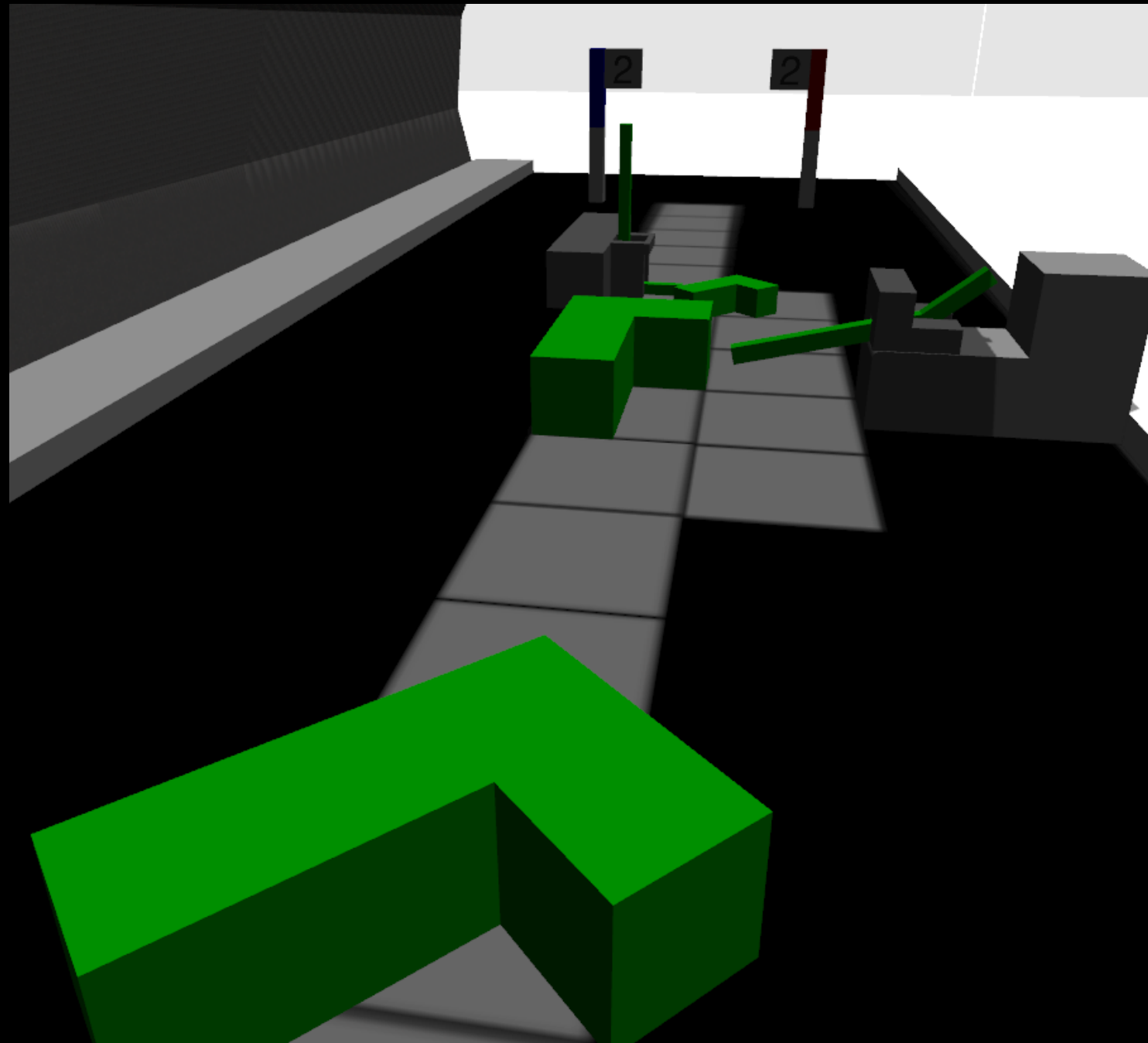
Description of New Simulation Platform [Part2]

- Portmessa Nagoya RoboCup WCS 2017 venue model
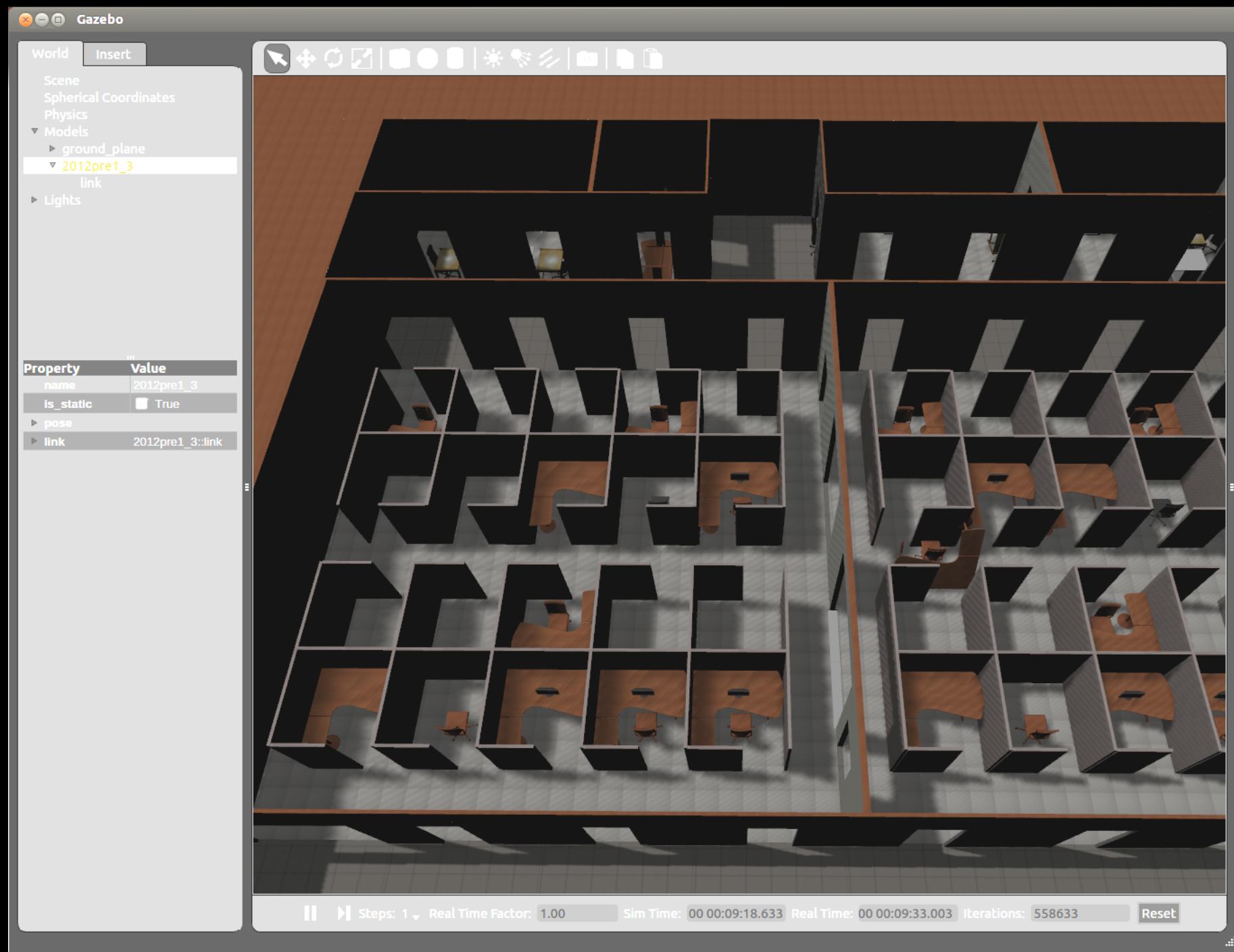
Introducing sample robots included in the new simulation platform.

- And robots included current version of new simulation platform.
  - pioneer3at_with_sensors
  - Crawler_robot
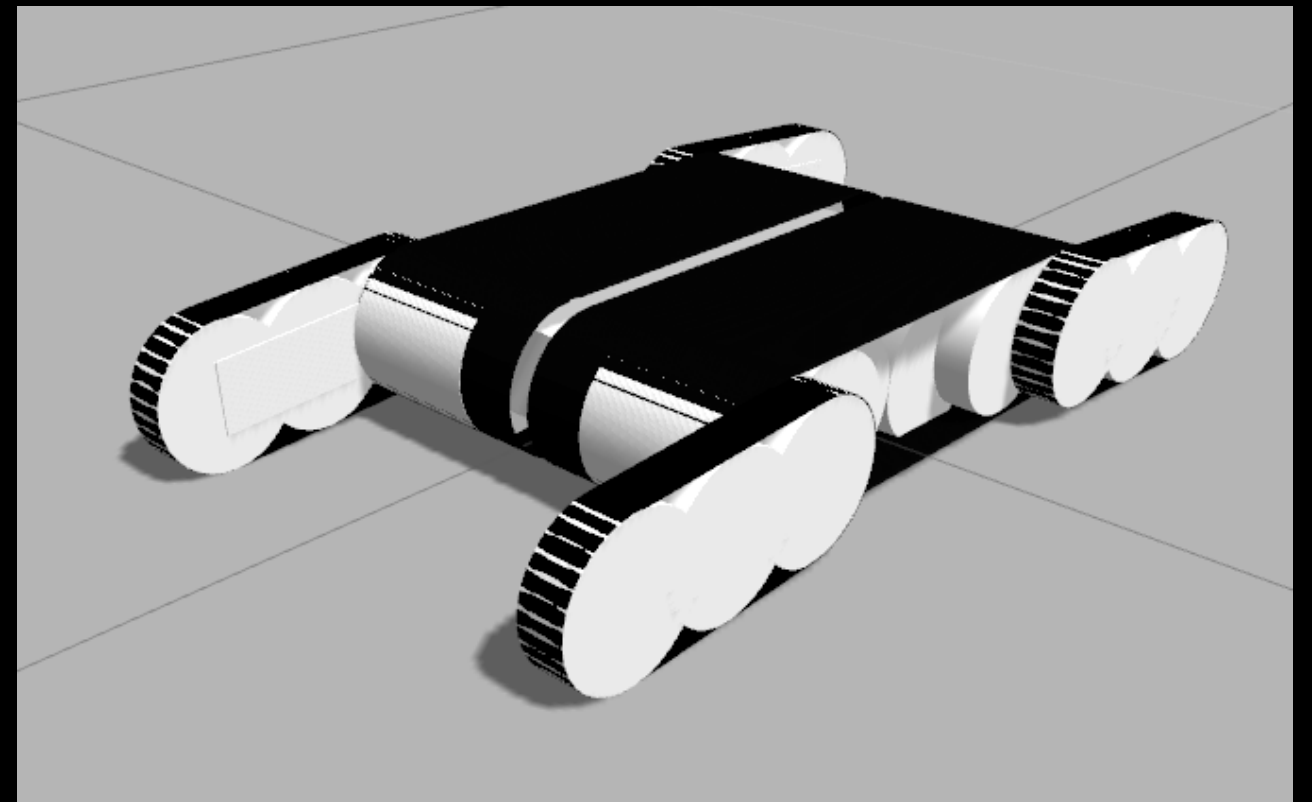
Intermission

- Which Protocol shall we use in future of this league, GameBot or Gazebo native topics?

  - Many teams are using ROS.

    - Gazebo   :   Topics

      ↑   ↓

      A PROTOCOL
      CONVERTOR

      ↑   ↓

    - Each team's USARSim client software   :   GameBot Protocol

19

Intermission

- Which Protocol shall we use in future of this league, GameBot or Gazebo native topics?

  - Many teams are using ROS.

    - Gazebo   :   Topics
                                                          ↑ ↓
                                                     A PROTOCOL
                                                     CONVERTOR
                                                          ↑ ↓

    - Each team's USARSim :   GameBot Protocol
      client software

Intermission

- Which Protocol will we use in future of this league, GameBot or Gazebo native topics?

    - Many teams are using ROS.

        - Gazebo   :   Gazebo Topics
                                                              ↑   ↓
                                                         A PROTOCOL
                                                         CONVERTOR
                                                              ↑   ↓

        - Each team's USARSim : ROS Topics   +   GameBot Protocol
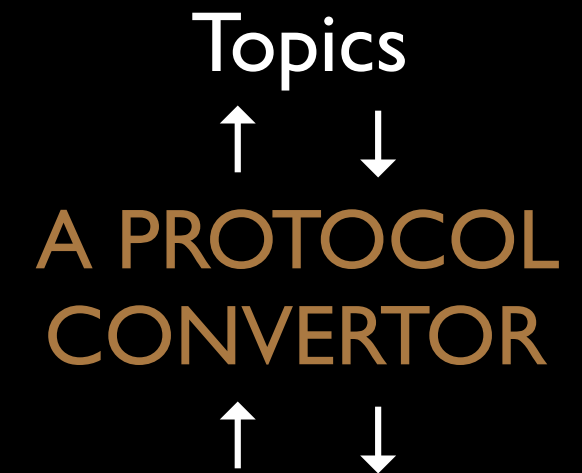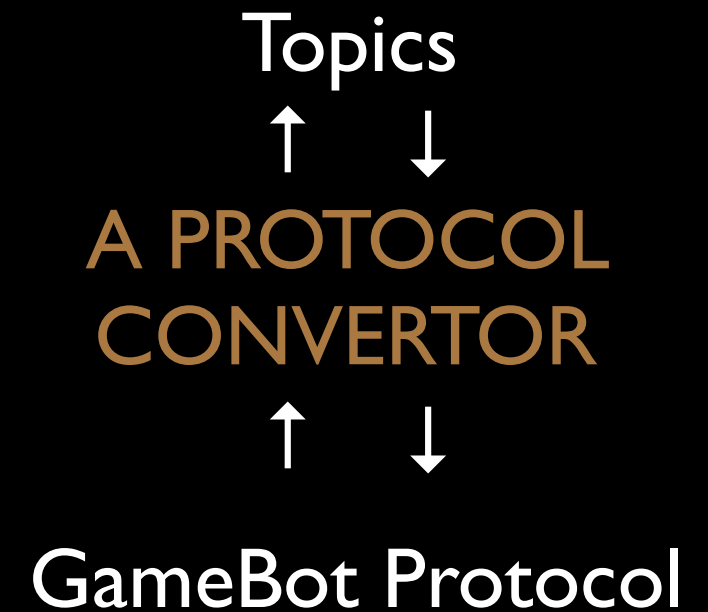   client software

Intermission

- Which Protocol shall we use in future of this league, GameBot or Gazebo native topics?

  - Many teams are using ROS.

    - Gazebo : Gazebo Topics
      ↑ ↓
      A PROTOCOL CONVERTOR
      ↑ ↓

    - Each team's USARSim : ROS Topics + GameBot Protocol client software
      ↑ ↓

    - ROS : ROS Topics

Intermission

- Which Protocol shall we use in future of this league, GameBot or Gazebo native topics?

  - Many teams are using ROS, then there is another way......

    - Gazebo   :   Gazebo Topics
                                                              ↑   ↓

      > A PROTOCOL CONVERTOR
      > ↑   ↓
      > GameBot Protocol

    - Each team's USARSim : ROS Topics   +
         client software
                                        ↑   ↓

    - ROS   : ROS Topics

Intermission

- Which Protocol shall we use in future of this league, GameBot or Gazebo native topics?

  - Many teams are using ROS, then there is another way !!

    - Gazebo   :   Gazebo Topics
                                                         ↑   ↓

                                                         ↑   ↓

    - Each team's USARSim : ROS Topics   +   Gazebo Topics
          client software
                                    ↑   ↓

    - ROS   : ROS Topics

Intermission

- Which Protocol shall we use in future of this league, GameBot or Gazebo native topics?
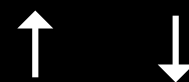
  - Many teams are using ROS, then there is another way !!

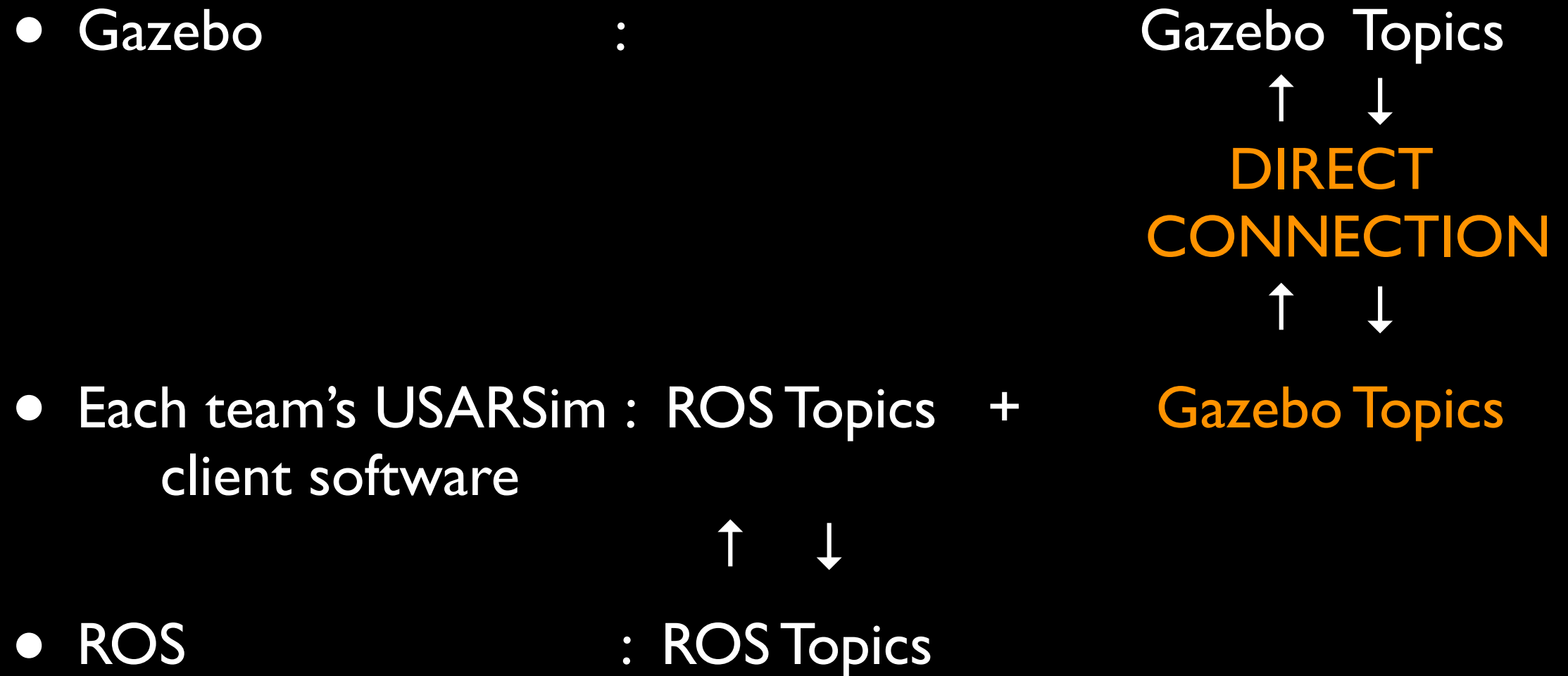   - Gazebo   :   Gazebo Topics
                                                                                ↑   ↓
                                                                          DIRECT
                                                                          CONNECTION
                                                                                ↑   ↓

    - Each team's USARSim : ROS Topics   +   Gazebo Topics
      client software
                                                    ↑   ↓

    - ROS   : ROS Topics

25

Intermission

- **GameBot V.S. Gazebo Topics in game.**

Things	Using Gazebo Topics	Using GameBot
Guarantee fair game by the game system (Gazebo topics can control every elements for getting score)	No	Yes
Easy to add new robots and devices	Yes	No
Speedy to share new technologies from each teams	Yes	No
Easy to maintain the game platform	Yes	No

Intermission

- How do you think?

  - Keeping GameBot ?

  - Moving to Gazebo topics?

The end of introducing the new simulation platform.

- Question Time

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