

# Avoidance method for unexpected impassable paths in traffic simulator

AIT-Rescue



1. Background
2. Processing in Current Traffic Simulator
3. Focused Issue
4. Approach
5. Design and Implementation
6. Current Status

# 1. Background

2. Processing in Current Traffic Simulator

3. Focused Issue

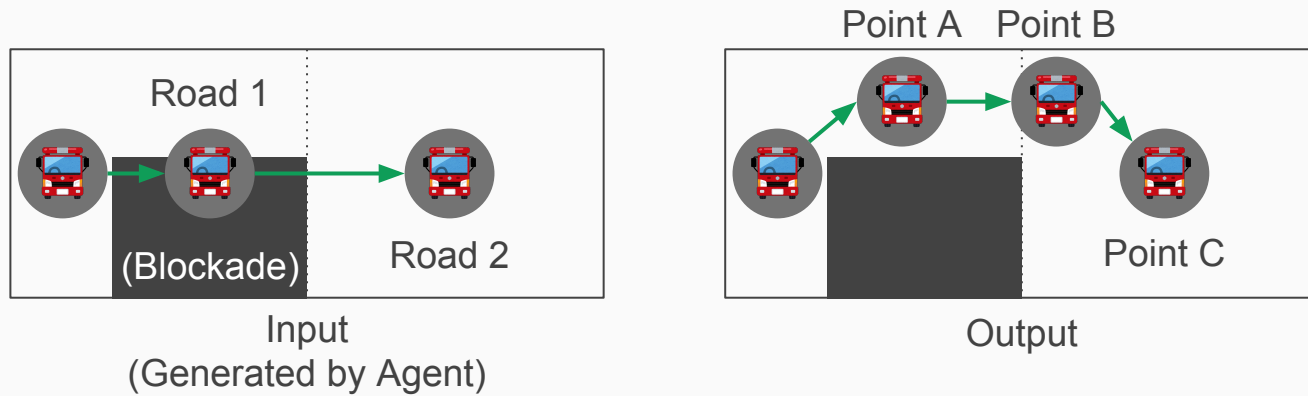
4. Approach

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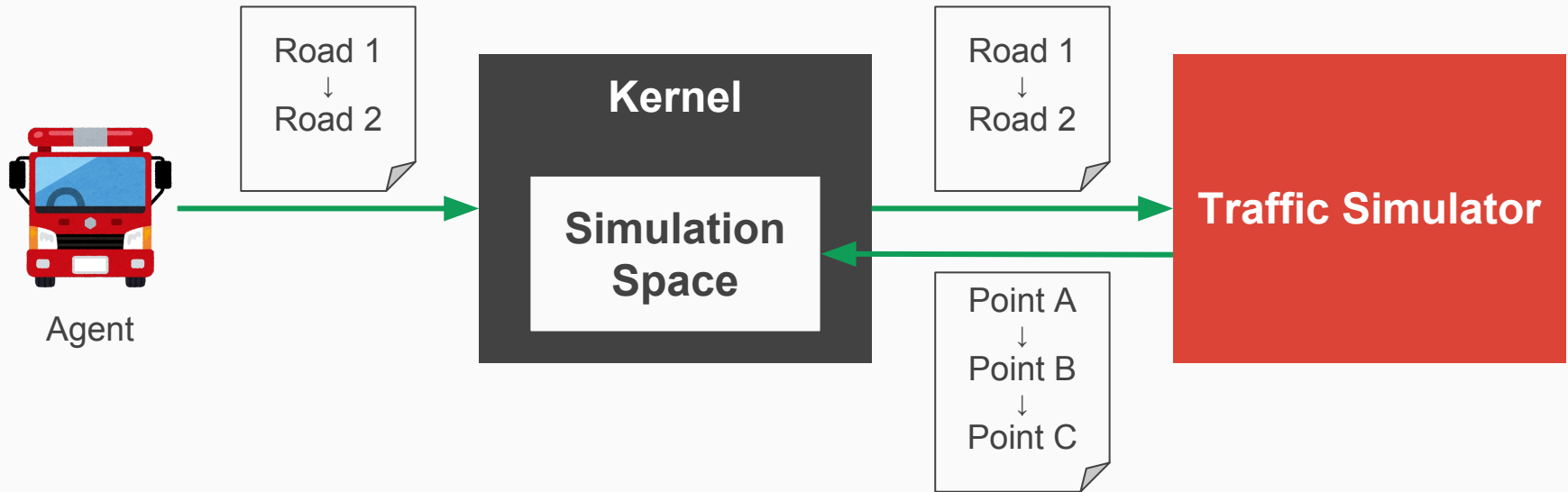
# 1. Background - What Is Traffic Simulator

- One of RRS sub-simulators
- Reflects the movement commands in the simulation space



# 1. Background - What Is Traffic Simulator

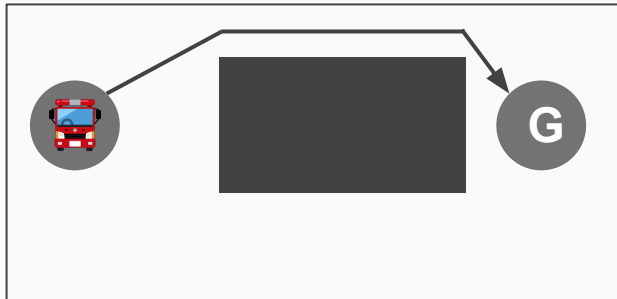
- One of RRS sub-simulators
- Reflects the movement commands in the simulation space



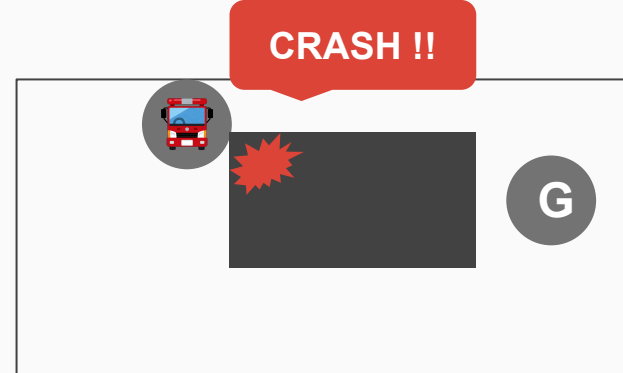
# 1. Background - Overview of Problem

- Sometimes, this simulator derives incorrect coordinates

For example:



Derived Path



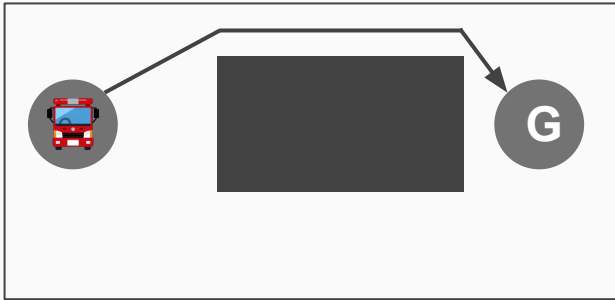
Result

# 1. Background - Overview of Problem

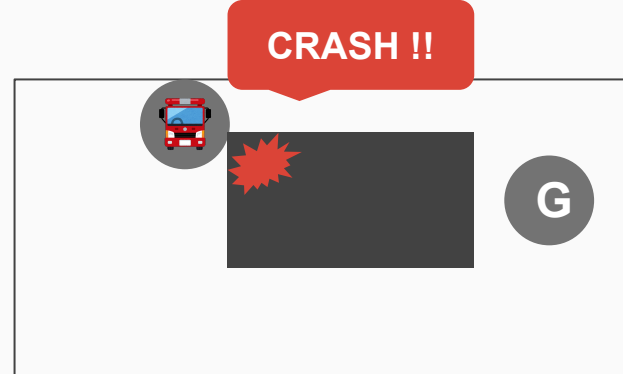
- Sometimes, this simulator derives incorrect coordinates

→ This problem should be corrected to simulate rightly

For example:



Derived Path



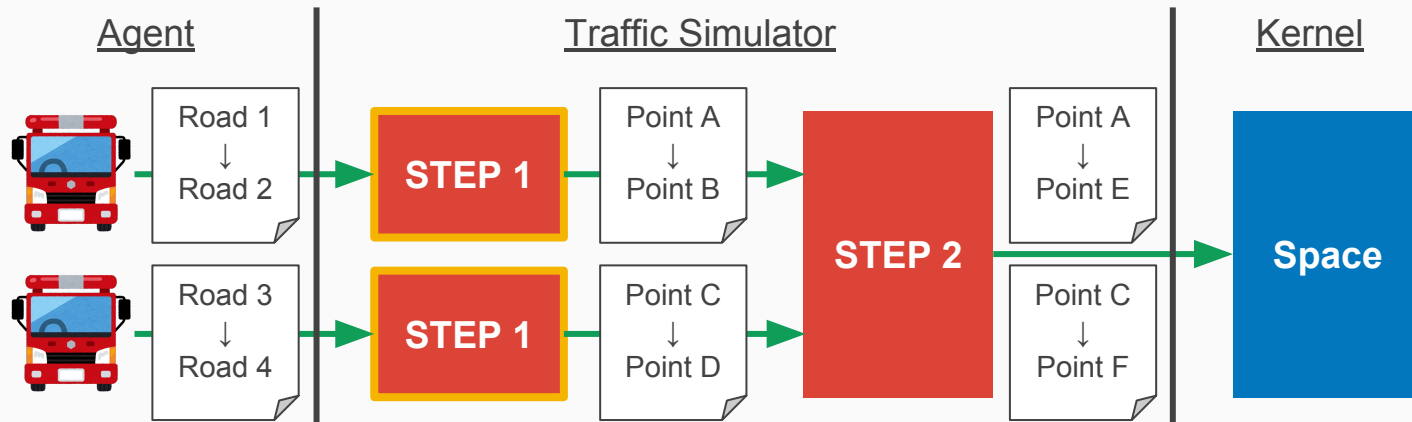
Result

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- 2. Processing in Current Traffic Simulator**
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## 2. Processing in Current Traffic Simulator

- Consists of 2 steps
  1. Plans a detailed path for each agent
  2. Adjusts detailed paths of all agents by collisions

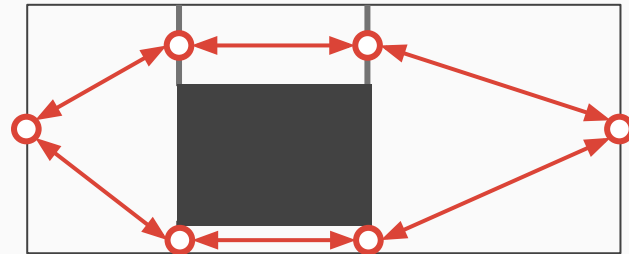


## 2. Processing in Current Traffic Simulator - STEP 1

1. Planning a detailed path for each agent
  - 1.1. Decomposes each area into some cells and creates a graph
  - 1.2. Performs path planning in each graph



Decomposing

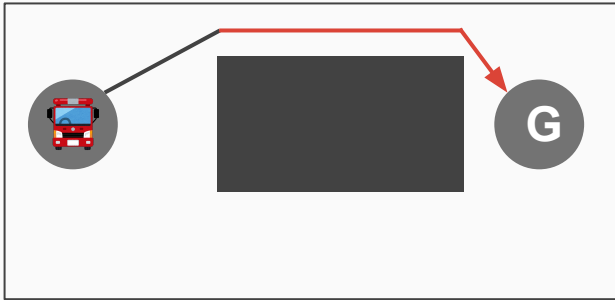


Graph

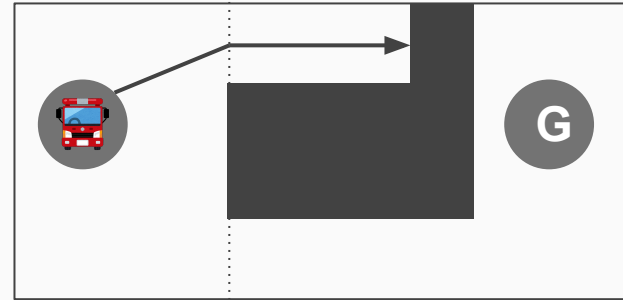
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## 2. Focused Issue

- Sometimes, the simulator plans impassable detailed paths



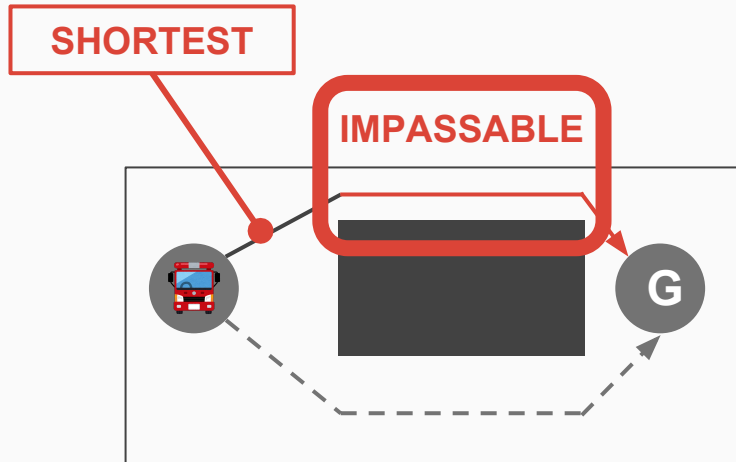
CASE 1



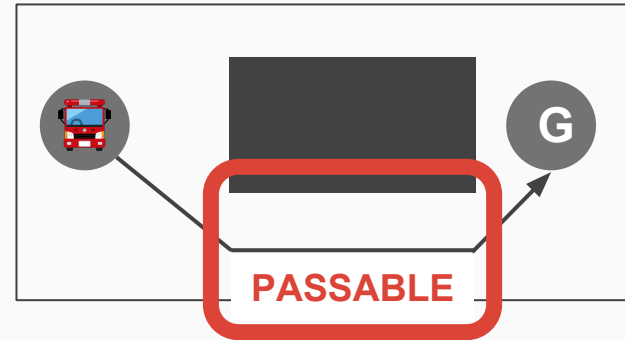
CASE 2

## 2. Focused Issue - CASE 1

1. Plans a detailed path which is smaller than an agent size



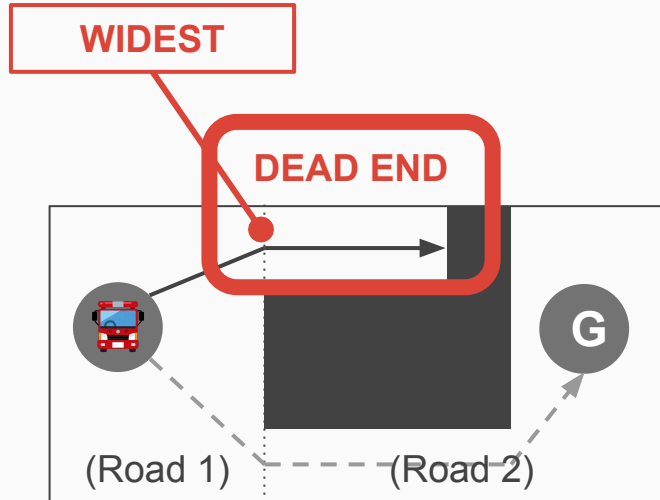
Planned Movement



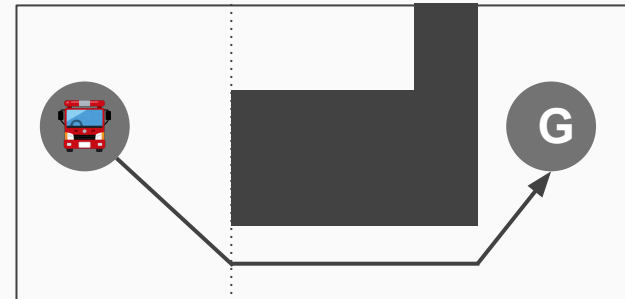
Ideal Movement

## 2. Focused Issue - CASE 2

2. Plans a detailed path which has a dead end



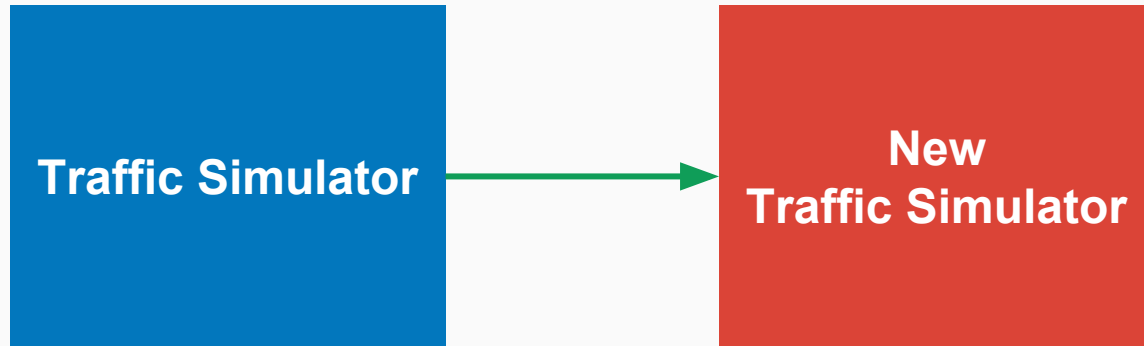
Planned Movement



Ideal Movement

## 2. Focused Issue - Goal

- We change the simulator to plan the ideal detailed paths
- We aim to allow the automatic and appropriate movements

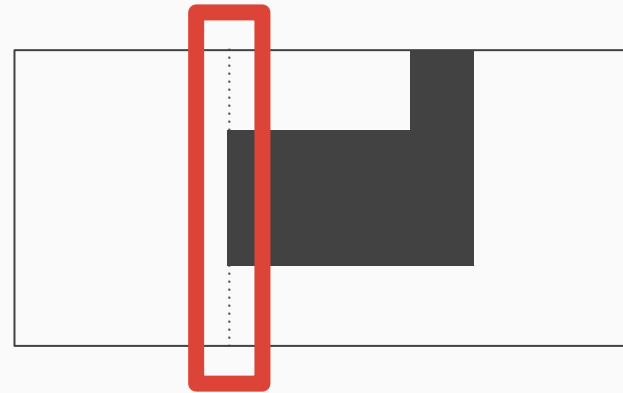
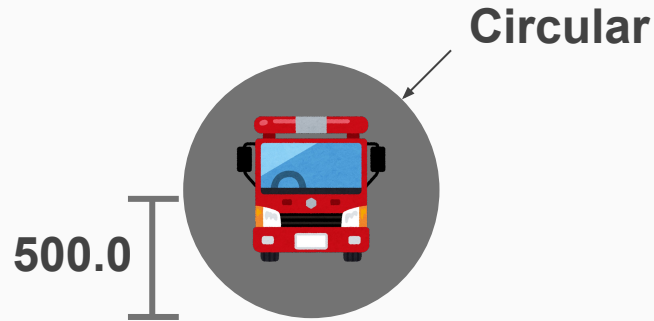


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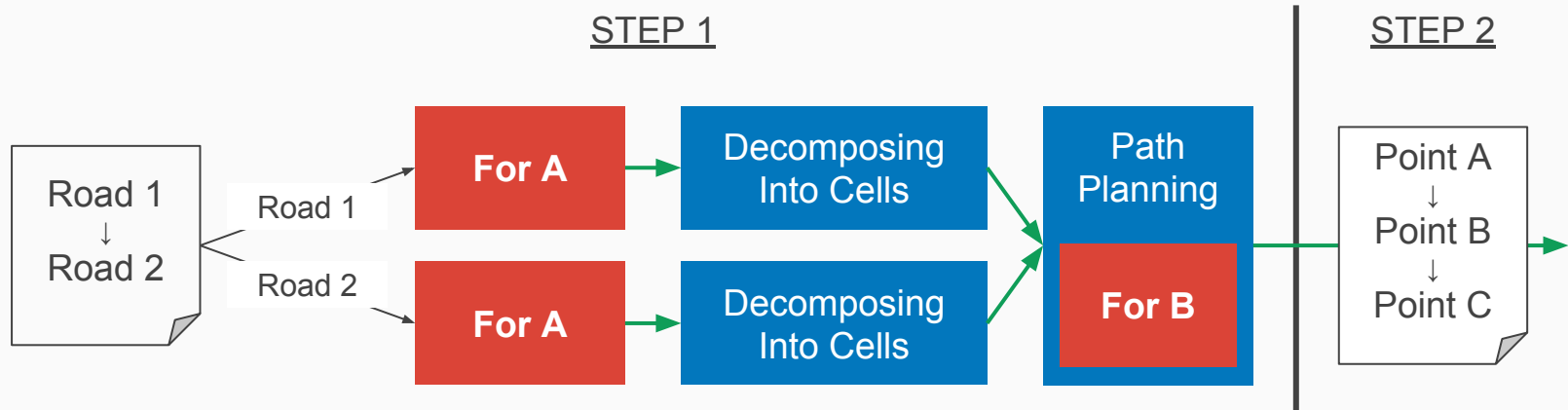
### 3. Approach

- We introduces the features to STEP 1 of current traffic simulator
  - A. The size of an agent
  - B. The state of connection of roads



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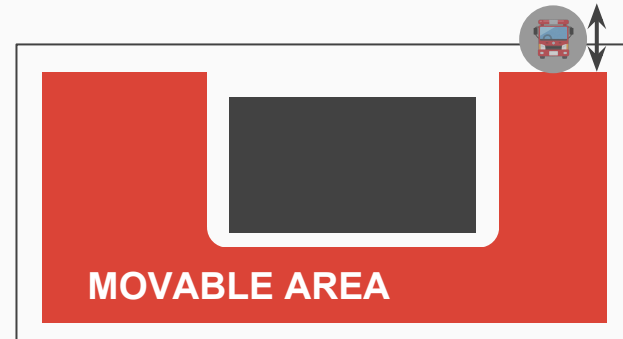


### 3. Approach - The size of an agent

- Planning a path while considering the feature is difficult  
→ Our approach extracts a movable area of an agent,  
to plans by regarding an agent as a dot



Before



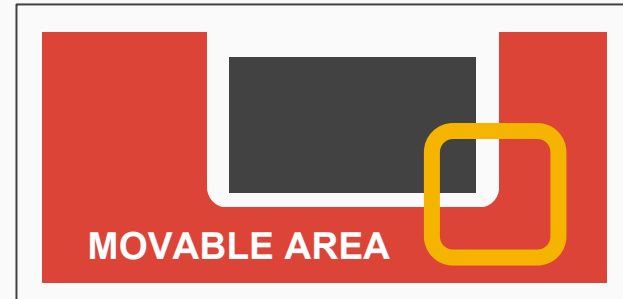
After

### 3. Approach - The size of an agent

- Path planning while considering the feature is difficult
  - Extracts a movable area for agent
  - **Curves always appear & Curves are inconvenient with the decomposing**



Before



After

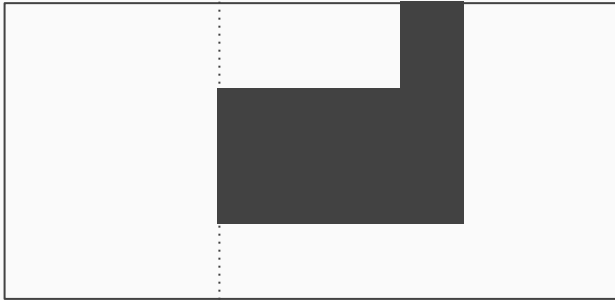
### 3. Approach - The size of an agent

- Uses a tiny extracting method which is not generate curve
- Complements some cells containing curves at the decomposing

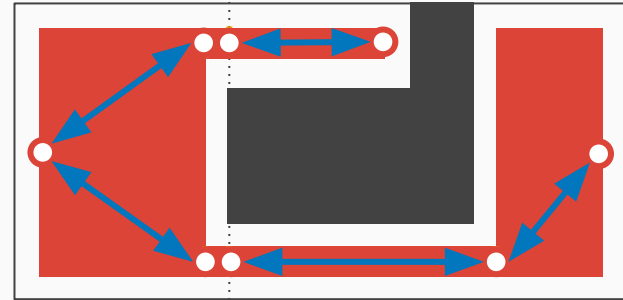


### 3. Approach - The state of connection of roads

- Connects graphs of required roads from the beginning  
→ Knows whether a dead end exists



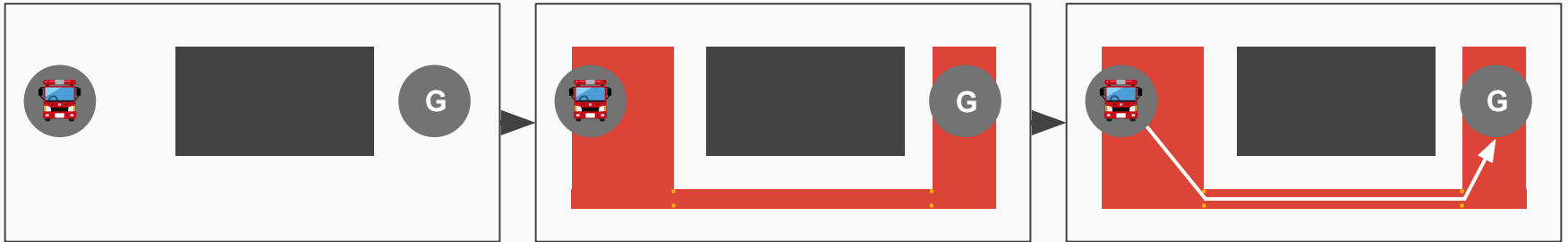
Before



After

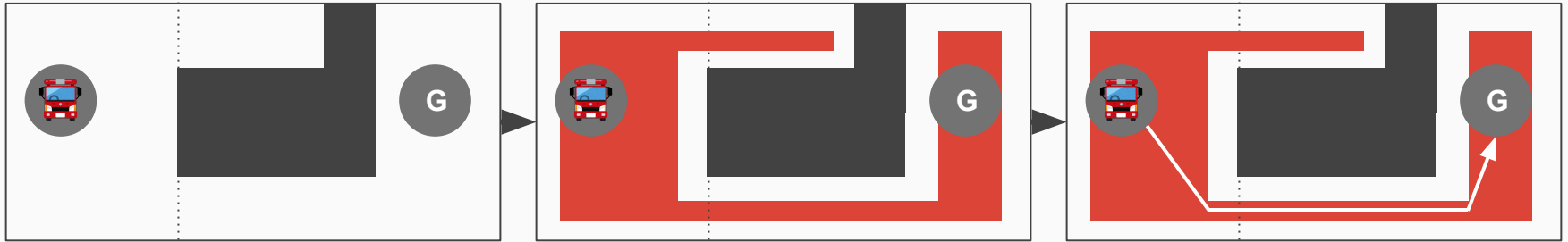
### 3. Approach - Expected results

- Applies our approach to the first 2 cases  
→ Our approach can avoid the impassable paths



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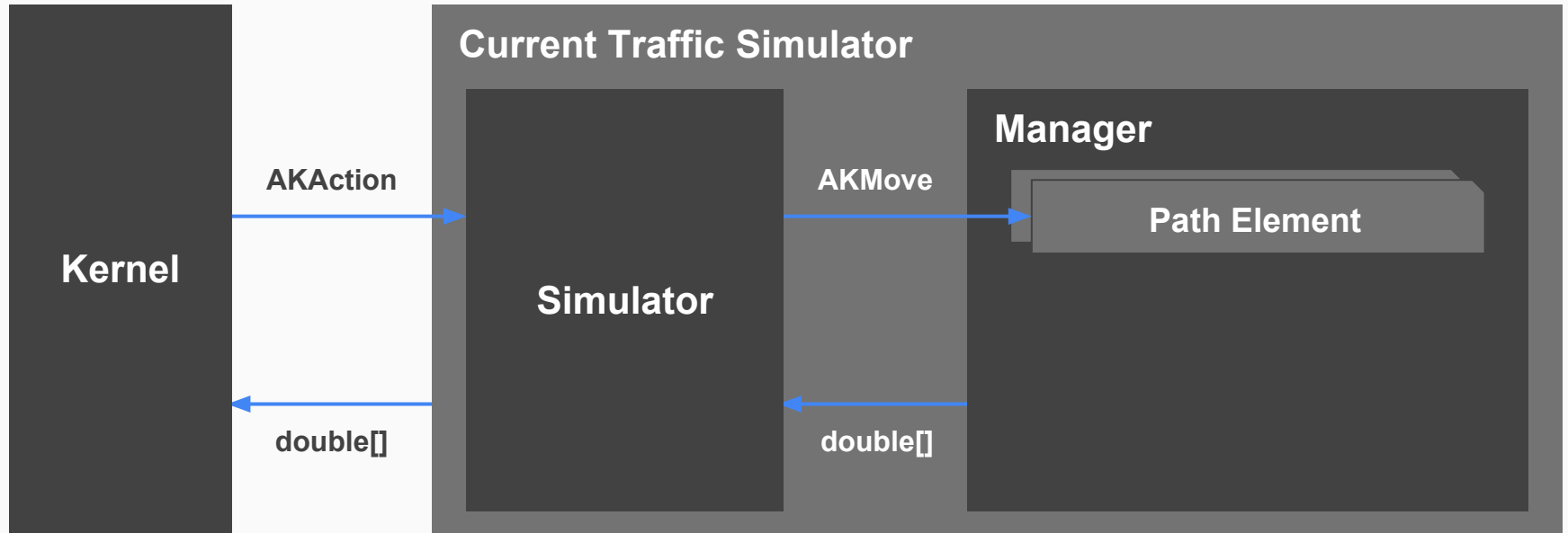




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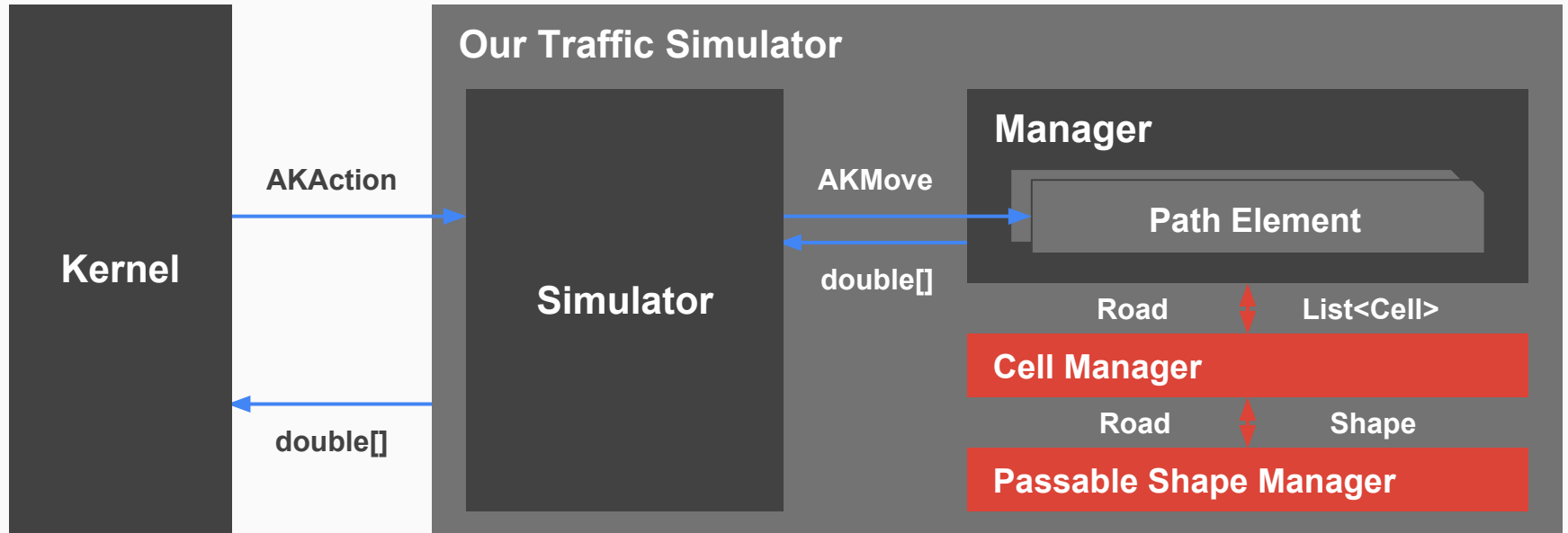
## 4. Design and Implementation - Design

- We designed our traffic simulator based on the current.



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## 4. Design and Implementation - Implementation

- Our approach frequently uses geometry processings

→ Uses **java.awt.geom** packages

- Area
- PathIterator
- Path2D ...

## 4. Design and Implementation - Implementation

- I am not used to geometry processings

→ I spent a lot of time to implement this simulator

- Number of lines of the source code : 3000 ↑
- Small errors are occurred → Need to absorb the errors

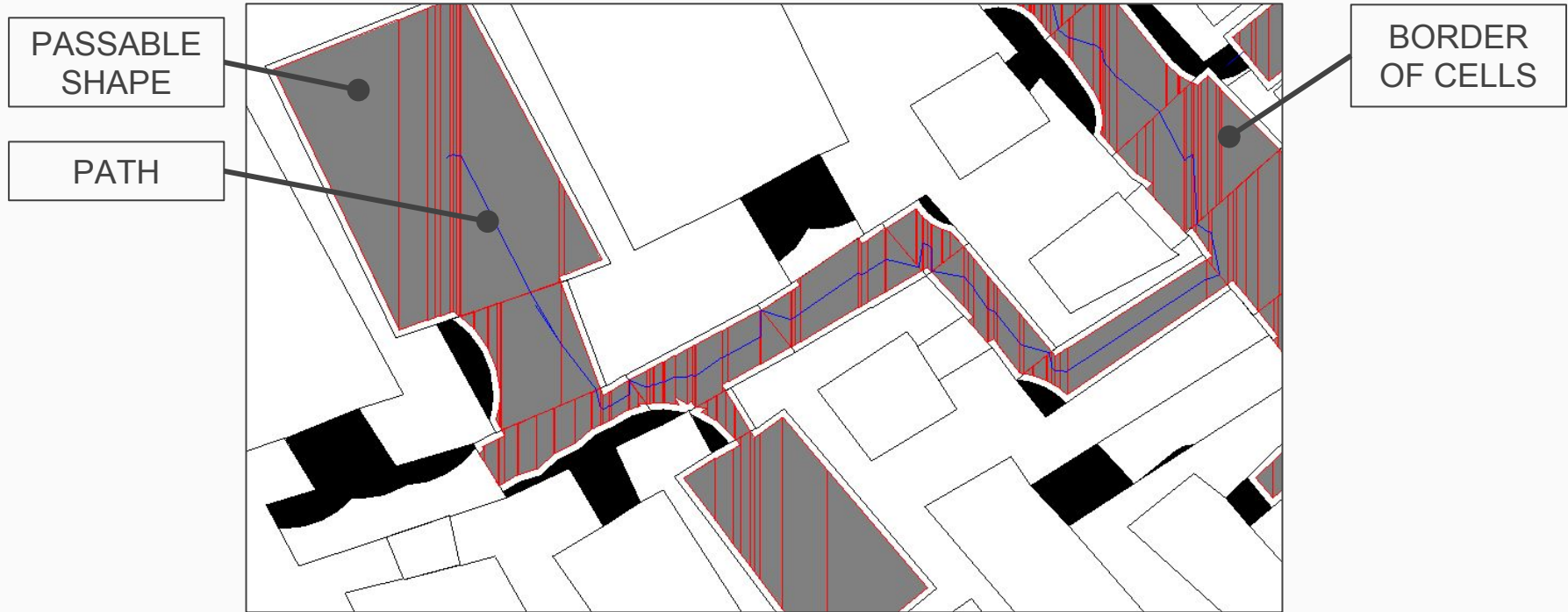
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## 5. Current Status

- I have finished implementing a prototype of this simulator
- I'm debugging this simulator now
- Further testing and improvement are necessary for using in our competition
- You can get this simulator from  
<https://github.com/miya224/TinyTraffic.git>

## 5. Current Status

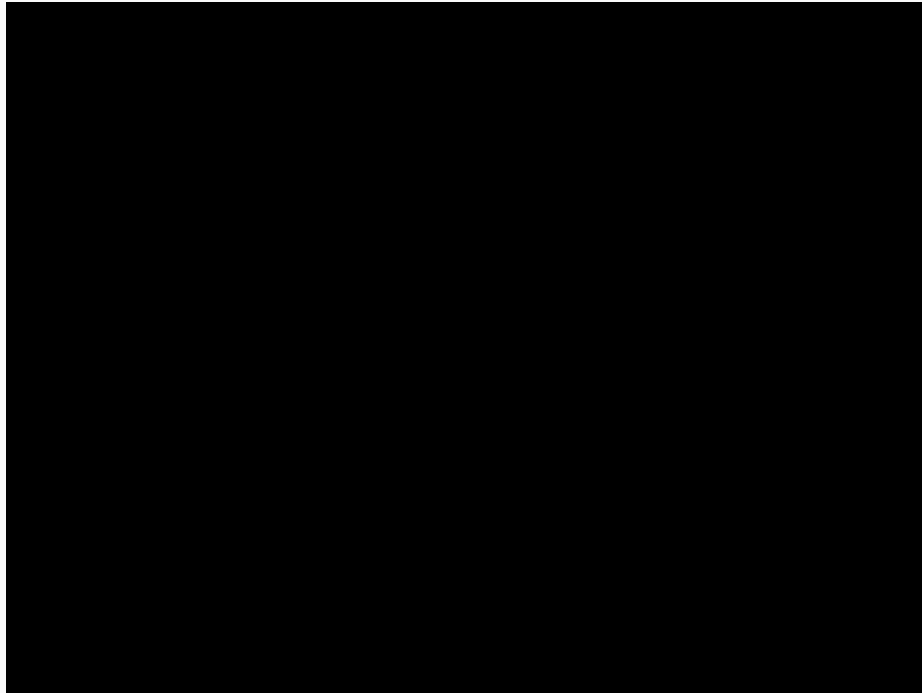
1. A detailed path is planned by our traffic simulator





## 5. Current Status

2. Moves all agents



Thank you!