1. 什么是共享空间？解释；他与正常的交通设计有何不同之处，时空分割/相比于交通规则，影响更大的则是社交礼仪。建设方便，对城市区和拥挤人群效率更好。（2014）但是，安全性还需要进一步挖掘，因此，模型很有必要。进一步理解和预测也能辅助自动驾驶。模拟的难点在于人类和社会因素的复杂的影响了决策方式。j

据我所知，没有很多模拟共享空间的工作。人类间互相影响的有 sc， 后来他被extended了很多遍题。与此同时，模拟复杂人类决策，的侧理论模型如xx和xx也很重要。

举个栗子，一个五信号的十字路口，涉及到行人和车辆间的避免碰撞的运动。通常行人的决策内容包括xxxxxxxx，车辆的决定包括xxxxx。

在Pascucci 的论文中提到xxxx解决，但这个模型的问题在于xxxxx。在xxx的论文中用了博弈论，但是两个模型都只考虑了单个互动，而没有舵主提的相互交流。

以下模型可以模拟多主体的交流，比如xxx，xxx和xxx。尽管以上模型都提供了一些模拟思路，但是没有能够模拟多主体的，这正是共享空间经常出现的场景。

1. 研究问题和目标

论文的主要目的是，使用模型仿照现实世界中共享空间的互动机制。基于对现实录像的观察，我们将互动机制分为以下几个类别：

- 反射互动：xxxx

- 隐式互动：xxx

- 显示互动：xxx

- 跟随领导：xxxx

还有包含以上多种互动的模式。

综上所述，我们的目标是：

- 模拟并评估上述定义的互动机制

- 分析设计算法，去描述、识别、处理多种冲突（MC）

- 模拟异质性道路使用者

- 探索针对用户数量和异构性以及拓扑变化的不同场景的不同协商机制的可伸缩性

1. 方法

我们建议在以下三个方面对异类道路用户的运动行为进行建模：轨迹规划层，基于力的建模层和博弈论交互建模层。

- 轨迹规划层：

负责根据路线图来规划道路用户的轨迹避开静态障碍物，例如环境中的墙壁或树木。

- 基于力的层：

使用经典的SFM对道路使用者的驱动力进行建模通往目的地的道路使用者与静态障碍物的互动，补给行人，以及汽车或骑自行车的人的超车行为。建模领导者遵循行为并在用户之间进行明确的协商，另外的力量是计算。在这一层，结合游戏决策的额外力量也是计算。以穿越游戏为例，如果游戏的解决方案是那个行人将继续行走，车辆驾驶员将减速，然后在基于力的层中产生行人的加速力和车辆的减速力。但是，如果游戏决策是行人将计算一条新的轨迹，则轨迹规划层将首先处理该问题。

- 博弈论交互建模层：

使用以下方法处理道路用户之间的复杂冲突：领导者跟随者游戏，也称为Stackelberg游戏。通常是两个阶段的游戏，领导者先致力于策略，然后跟随者选择策略通过考虑领导者选择的策略来优化其效用（Pita等，2009）。我们选择该游戏的原因是：首先，在共享空间场景中，它可能是通常会看到其中一位道路使用者会初始化反应，而其他道路使用者会跟随。其次，该游戏在研究文献中最常用于描述道路使用者的互动。（多个引用）。

目前的工作： 第一步是了解，建模和模拟交互机制共享空间中的道路使用者数量。为了模拟不同的共享空间方案，我正在使用lightjason，一个基于多代理的框架。下一个计划是进行定性和与Su-联合开展的交通安全和公平条件定量分析sanneGrüner和Hao Cheng，然后将发现包括在仿真模型中。的该模型的验证是通过使用现有的（从更高的项目），并期望（来自郝成）来自共享空间的真实世界轨迹环境。最后，我打算研究模型参数之间的交叉关系。博弈论互动模型和共享空间设计的考虑公平与安全问题。

1. 总结

本次展览概述了我的博士学位的研究主题，目标，主要目标，方法，工作流程和时间表（请参阅附录A）。 论文。 它旨在构建一个仿真模型来模拟共享空间中异构道路用户的交互行为。

1. 什么是共享空间？现有共享空间有什么缺陷？

“Shared space” is an urban design strategy first proposed by Dutch traffic engineer Hans Monderman. In general, it decreases separation between all kind of road users by removing traffic features such as kerbs, road surface marking, traffic signs and traffic lights. The inventor of shared space believe that, by increase the sense of uncertainty and unclear of prioirity, drivers will pay more attention and slow down when passing through the shared space. Therefore, the dominance of vehicles as well as the rates of casualty decreases. The other road users (e.g. pedestrians and cyclists) gain more priority, also improve their safety.

However, as this urban design method is applied all over the world, the safety issues also arise. For instance, In the UK, a serious accident happens, when a blind man tried to pass through shared space, a van crushed on him and unfortunately he died. Later, a survey on how does people feel about using shared space launched. The feedback is relatively negative. Pedestrians and cyclists reported that they felt they were bullied by vehicles, meanwhile, from the driver's side, it is hard to estimate where will the others go when there is no traffic signs.

Not only safety aspect, current shared space has efficiency problem as well. When the traffic flow is quite high, it shows a bottleneck effect because there‘s no traffic lights to follow with.

To solve these problem, we come up with a hypothesis: by grouping traffic participants when they crossing, the safety and efficiency will increase. This is intuitive because when pedestrians become a group, they will gain more priority compared with individuals(case 4 & 3). What‘s more, grouping can decrease the number of traffic participants, therefore, it's easier to manage how all participants pass the shared space (case 1), the traffic flow will be more fluent.

1. 为什么要分组？组的定义是什么？组有什么好处？

a) Social factors: Among the social factors, per-haps, group size is one of the most influential ones.

Heimstra et al. [36] conducted a naturalistic study to examine the crossing behavior of children and found that they com-Heimstra et al. [36] conducted a naturalistic study to examine the crossing behavior of children and found that they com-monly (in more than 80% of the cases) tend to cross as a group rather than individually. Group size changes both the

monly (in more than 80% of the cases) tend to cross as a group rather than individually. Group size changes both the

behavior of the drivers with respect to the pedestrians and the

way the pedestrians act at crosswalks. For instance, it is shown that drivers more likely yield to groups of pedestrians (3 or

way the pedestrians act at crosswalks. For instance, it is shown that drivers more likely yield to groups of pedestrians (3 or

more) than individuals [40], [43].

When crossing as a group, pedestrians tend to be more

careless, and pay less attention at crosswalks and often accept

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shorter gaps between the vehicles to cross [11], [41], [44] or do not look for approaching traffic [42]. Group size is also

shorter gaps between the vehicles to cross [11], [41], [44] or do not look for approaching traffic [42]. Group size is also

found to impact the way pedestrians comply with the traffic

laws, i.e. group size exerts some form of social control over individual pedestrians [45]. It is observed that individuals in

laws, i.e. group size exerts some form of social control over individual pedestrians [45]. It is observed that individuals in

a group are less likely to follow a person who is breaking the

law, e.g. crossing on the red light [28]. In addition, group size, for obvious

law, e.g. crossing on the red light [28]. In addition, group size, for obvious reasons, influences

pedestrian flow which determines how fast pedestrians cross the street. Wiedemann [46] indicates that if there is no inter-pedestrian flow which determines how fast pedestrians cross the street. Wiedemann [46] indicates that if there is no inter-action between the pedestrians, there is a linear relationship

between pedestrian flow and pedestrian speed. This means, in general, pedestrians walk slower in denser groups.

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1. 现有的组主要在处理什么？

One of the first solutions for simulating (single) group behavior was introduced

by Reynolds in 1987 [17]. His influential boids model, comprising simple local behaviors such as separation, cohesion and alignment, yielded flocking behavior of the units. While this model resulted in natural behavior for a flock of birds or school of fish moving in an open environment, they could get stuck in cluttered areas.

Bayazit et al. [2] improved this model by adding global navigation in the form of a roadmap representing the environment’s free space. While the units did not get stuck anymore, they could break up, losing their coherence.

By following a point that moves along a backbone path centered in a two-dimensional corridor, coherence was guaranteed by the method proposed by Kamphuis and Overmars [9]. In their method, the level of coherence was controlled by two parameters, namely the corridor width and the group area.

When multiple units are involved, possible interference between them complicates the problem, and, hence, some form of coordination may be required to solve the global problem. From the robotics field, two classes of methods have been proposed. Centralized methods such as references [18,19] compute the paths for all units simultaneously. These methods can find optimal solutions at the cost of being computationally demanding, usually making them unsuitable for satisfying the real-time constraints in games.

Decoupled methods compute a path for each unit independently and try to coordinate the resulting motions [15,21]. These methods are often much quicker than centralized methods but the result- ing paths can be far from optimal.

Also hybrid methods such as references [7,13] have been proposed.

A variant to solving the problem is called prioritized motion planning [14,23]. According to some prioritization scheme, paths are planned sequentially which reduces the problem to planning the motions for a single unit. It is however not clear how good these schemes are.

* 1. 组navigation
  2. 单独一个组的
  3. 缺少结合group dynamics的研究（？），缺少online处理多个组的方式，缺少和地理位置结合的方式（？）