[AAMAS2014] Your Paper #786

AAMAS2014 <aamas2014@confmaster.net> 19 December 2013 21:38
To: Dengji Zhao <dengji.zhao@gmail.com>
Cc: Dongmo Zhang <d.zhang@uws.edu.au>, Enrico Gerding <eg@ecs.soton.ac.uk>, Yuko Sakurai <ysakurai@inf.kyushu-u.ac.jp>, Makoto Yokoo <yokoo@inf.kyushu-u.ac.jp>, AAMAS2014 <aamas2014@confmaster.net>

Dear Dengji Zhao, Dongmo Zhang, Enrico Gerding, Yuko Sakurai, Makoto Yokoo

Congratulations, we are pleased to inform you that your paper #786
with title: Incentives in Ridesharing with Deficit Control
has been accepted as a full paper for publication in the proceedings
of the 13th International Conference on Autonomous Agents and Multiagent Systems (AAMAS2014).

The review process was extremely selective. Out of the 709 submissions
that were reviewed, the program committee selected 169 papers for full
presentation (8 pages) and 159 papers for poster presentation (2 pages).
These totals include the Virtual Agents, Robotics, Innovative Applications
and Challenges & Visions special tracks.

The reviews of your paper are included below. In addition to the text
of the (possibly revised) initial reviews that you have already seen,
the reviews include a numerical score (from 1 to 10) and, in some cases,
the review of the SPC member and any additional reviews that were
solicited during the discussion phase. Please be aware that the
numerical ratings are not always indicative. As you know, each PC
and SPC member only saw a small subset of the overall submissions.
In selecting the final program, the program chairs read through the
detailed recommendations from the PC and SPC and made decisions
based on the overall set of papers.

Though there will be no further review of your paper, in some cases
the acceptance decision was influenced by the assumption that you
would improve your paper according to the reviewer comments, or your
rebuttal. As you prepare the final version of your paper, please take
these issues into account in order to publish the best possible article.

Full papers are allowed 8 pages in the proceedings. The final versions
of full papers are due by the 14th February 2014. In a later message
we will provide you with the copyright and formatting instructions so
that you can prepare and submit the final camera-ready version.

For your paper to be published, at least one author must register for
the conference and attend to present it. All accepted papers will also
be presented as posters. As a result, the poster sessions will be a
very important part of the overall program and we look forward to
having your poster there.

We are delighted to announce that we have funding for student travel
support. The purpose is to enable full-time students at a higher
education institution to travel and participate in the conference.
If one of the paper authors is a student, please see this page for
more information: http://aamas2014.lip6.fr/studentTravel.php.
The deadline for applications is the 29th of January 2014.

The full conference program will be available on the conference
website in a few weeks.

Congratulations again and we look forward to seeing you at
AAMAS2014 this coming May in Paris.

Best regards,

Alessio Lomuscio and Paul Scerri
AAMAS 2014 Program Chairs
---------- Review ----------
Relevance : 8
Originality and novelty : 7
Significance : 6
Readability and organization : 8
Technical quality and soundness : 8
Overall recommendation (Full Paper) : 7
Overall recommendation (Extended Abstract) : 8
Reviewer Confidence : 7

-- Comments to the author(s):
METAREVIEW

Two of the reviewers were clearly in favor, but one was initially opposed due to concerns that some of the assumptions would be too unrealistic in practice. As the authors point out, though, there are some indirect / coarse / imperfect ways of dealing with these issues within the framework. Perhaps more importantly, follow-up work may be able to address these issues in a cleaner way, and a sequence of papers that addresses these issues completely would be highly valuable. With this in mind, it will be good if the authors make clear the limitations of their results in the paper, to make it easier for future work to address these.
-- Summary:
METAREVIEW

Rigorous contributions on an important problem. There is a sense that the assumptions are still too strong to be practical for now (though some quick hacks in the framework might make this close to practical), but there is hope that future work might improve on this, which is why we support acceptance.
---------- End of Review ----------
---------- Review ----------
Relevance : 8
Originality and novelty : 8
Significance : 7
Readability and organization : 9
Technical quality and soundness : 8
Overall recommendation (Full Paper) : 7
Overall recommendation (Extended Abstract) : 7
Reviewer Confidence : 6

-- Comments to the author(s):
SUMMARY

The paper studies different variations of market-based systems for ride sharing. The initial, VCG-based system is shown to be incentive compatible and individually rational but has the drawback of high deficit. In order to counter this problem, alternative mechanisms are considered and eventually methods are given in which the deficit can be controlled under certain restrictions of the original problem.

RELEVANCE

The paper presents a novel market-based system for ride sharing. Mechanism design is an important area within multi-agent systems research and applying such techniques to real-world applications such as ride sharing is very important, if we are to test the abstract theoretical models these techniques use under real-world assumption.

ORIGINALITY

The paper introduces an extensive ride sharing model and provides theoretical results based on the model while maintaining truthfulness from the participants of the system. Previous work on ride sharing focused on experimental results based on simpler mechanisms that arose from well-known previous results. Thus, this paper covers an important gap in ride sharing scenarios as it enables a theoretical investigation of novel types of market-based systems appropriate for this domain.

SIGNIFICANCE

Theoretical contributions with an eye towards real-world applications are very important for AAMAS. The significance of this paper arises from attempting to push existing models toward realism in the target application domain, while maintaining a rigorous level of analysis that allows the authors to provide hard performance guarantees. With this respect, its most important contribution is to develop a model of ride sharing that is much more detailled and fine-grained than general models of resource allocation.

TECHNICAL QUALITY

The paper is technically sound, and the main technical achievement is to The paper gives a solid example for the large deficits that can arise under the model. Further, it analyses several alternative mechanisms which may help control the deficit while still satisfying important game-theoretic properties, at least under certain restrictions. The main limitation of the paper is that it does not say much about the practical computational problems arising when computing rides etc, and about the complexity of the suggested algorithms - it would be good to see at least a high-level discussion of these issues.

QUALITY OF PRESENTATION

Overall the paper is clearly written, well organized, well presented, and motivates work for further research. The only minor comment that I have is that in the end of page 3 the line should read "... additional seat ...".

-- Summary:
The paper introduces a novel market-based system for ride sharing with a clear focus towards guaranteeing truthfulness from the participants which has not been the case in the limited past work in ride sharing applications. It shows that efficient and truthful ride matching may lead to large deficits, thus rendering the whole approach rather useless for application in practice. It then proposes methods to overcome this problem, showing that for less efficient alternatives, truthfulness can be maintained while at the same time providing good deficit control.
---------- End of Review ----------
---------- Review ----------
Relevance : 8
Originality and novelty : 6
Significance : 3
Readability and organization : 7
Technical quality and soundness : 7
Overall recommendation (Full Paper) : 6
Overall recommendation (Extended Abstract) : 8
Reviewer Confidence : 8

-- Comments to the author(s):
In this paper, the authors analyze a number of mechanisms for coordinating ride sharing under a specific setting. They first present a mechanism based on VCG payment, showing that it possess all important properties such as individual rationality, incentive compatibility, and efficiency. However, a critical weakness of such mechanism is its inability to achieve budget balance. They explore alternative mechanism designs to sacrifice efficiency for deficit control.

The sole focus of the paper is on proving theoretical properties of proposed mechanisms, and the authors indeed did a good job in constructing a complete framework for illustrating the existence (or non-existence) of all the desired properties. However, this focus on purely theoretical results has some undesirable consequences, mostly in terms of practicality, which are summarized below:

1. When looking at the valuation function for riders, we can see that as long as a rider is served, he will receive the same value c_i regardless of the travel time. In other words, the same c_i will be awarded regardless of the trip duration (which could have significant detour if the vehicle is shared by riders with far-apart destinations).

This is the most unrealistic assumption, and without also considering detour for riders, the resulting allocation will not be implementable (imagine a rider having to pay exactly the same price for a 10-minute trip and 30-minute trip).

2. If rider detours are to be considered, the resulting "dynamic ride-sharing problem" [1] (or more generally, the dial-a-ride problem [2]) has been studied extensively in the literature. Both problems are known to be extremely difficult, and even the state-of-the-art exact optimization approach cannot scale beyond 40-50 passengers (for DARP case). For dynamic ride-sharing problem, since the role (driver/rider) is also a decision variable, it will be even more difficult. As such, most of related literature focus on the development of heuristics instead.

As authors rightly pointed out in the conclusion, the problem they formulated, even without rider detour being considered, is already computationally challenging. Based on past research from the literature, it's pretty obvious the exact formulation will not scale too well, and this might make the mechanism intractable in practice, particularly if the mechanism is to be implemented in an online fashion.

3. The protocol of all introduced mechanisms is defined to be very general, as it allows a rider to be picked up and dropped off by an arbitrary number of drivers (e.g., the m-leg trip as illustrated in Figure 2). However, any ride-sharing service involving more than two legs is shown to be operationally challenging, as proper handover is always an issue, and exception handling needs to be considered carefully. This is why single-leg service is universal in all currently running commercial ride-sharing services. I think it would be reasonable to consider limiting the number of connection legs allowed.

[1] N. Agatz, A. L. Erera, M. W. Savelsbergh, and X. Wang, “Dynamic ride-sharing: A simulation study in metro Atlanta,” Transportation Research Part B: Methodological, vol. 45, no. 9, pp. 1450–1464, 2011.

[2] J.-F. O. Cordeau and G. Laporte, “The Dial-a-Ride Problem (DARP): Variants, modeling issues and algorithms,” 4OR, vol. 1, no. 2, pp. 89–101, 2003.

-- Summary:
SUMMARY OF REVIEW:

See my comments above.
---------- End of Review ----------
---------- Review ----------
Relevance : 8
Originality and novelty : 7
Significance : 8
Readability and organization : 8
Technical quality and soundness : 9

Overall recommendation (Full Paper) : 8
Overall recommendation (Extended Abstract) : 8
Reviewer Confidence : 7

-- Comments to the author(s):
The problem studied in this paper is fairly significant and the ridesharing could be potentially helpful to build a sustainable transportation system. The mechanism design theory is adopted to analyse the impossibility in designing IC, IR, efficient and budget balanced mechanism. Based on this analysis, two inefficient mechanisms are proposed. The problem is described clearly and the analysis is in high quality.

It is troublesome in using the terms of Proposition, Lemma, and Theorem in Section 2 and 3. They are not used in an appropriate and consistent way. Normally, propositions and theorems require proofs to support and lemmas do not necessarily need proofs. In this paper, the Proposition 1, 2 are not supported by proofs. They are recommended to be changed to Lemma if the proofs are so obvious or not necessarily included. The Lemma 1 should be changed to be a proposition by offering a proof. The Theorem 2 is not actually innovatively proposed by this paper, and a citation [10] should be attached.

-- Summary:
SUMMARY OF REVIEW:
---------- End of Review ----------