Dear Editor,

We would like to thank for the opportunity to review our paper. The reviewers´ comments and suggestions were important to improve the quality of our work.

We have prepared a new version of the paper together with some comments regarding the reviewers´ critics and recommendations.

We hope that the revised version of the paper meets the reviewers´ expectations and that our comments clarify all questions pointed out by them.

Best regards,
Amon Veiga Santana

Reviewer´s comment:
It is neither clear nor justified why the authors used the terms "stays" and "trails" instead of the well established terms "stops" and "moves".

Our Comment:
We add this paragraph in the section 3 of the paper.

"The terms Stops and Moves from the seminal work of (Spacapietra, 2008) are generic and aim at representing parts of a trajectory at high level of abstraction. Many work have specialized these concepts creating entities more suitable for the application domain. In this work, a Trail is a specialization of a Move and a Stay is a specialization of a Stop. A Stay is further specialized as a Visit in our model. We believe that Trail, Stay and Visits are more appropriate entities to represent the semantic rich parts of a traveler trajectory."

Reviewer´s comment:
The conceptual model of Stops a Moves, originally introduced by Spaccapietra , was originally instantiated by the work of Alvares et al 2007, that labeled stops of trajectories based on the intersection of the trajectory with geographic information. Zheng et al 2009 was a later work that already ignored all previous works on semantic trajectories. To what you propose in this paper, it is more appropriate to reference the work of Alvares et al 2007 as the one that finds stops or

points of interest according to the application, using time and relevant geographic information.
Another method to instantiate the model of stops and moves is the work of Palma et al 2008, which finds stops based on spatio-temporal clusters, similarly to what you propose to find "stays" by density. So I would suggest a reference to this method.
A recent work that extended the model of stops and moves to a more broad trajectory data model is Bogorny et al 2014, which indeed supports more semantic information than the model proposed in Spaccapietra et al 2008, including goals, transportation means, activity, POIs (Places), environment information, etc.

Our Comment:
We agree with the comment about the omission of the work of (Alvares et al, 2007), (Tietbohl Palma et al, 2008) and (Bogorny et al 2014). The new version of section 2 addresses these issues.

Reviewer´s comment:
Zheng et al. 2010 proposed a technique based on speed, acceleration and the orientation of the user to detect the transportation mode used to move from one place to another. However, this is not the only work in this domain, and there are several other works to infer transportation mode from GPS data.
This is an open research field, but in your paper it seems that Zheng's paper solved this problem.

Our Comment:
We do not consider research in the detection of transportation means as a closed topic, neither the work of the (Zheng, 2009) as something definitive. The reference to the work of Zheng is due its importance in the implementation of the algorithm for identification of the means of transportation in our tool. We believe that this point becomes clear in the new version of the paper.

Reviewer´s comment:
You reference [Gil et al 2014], but [Fileto et al 2013] is a more important work from the same group and much more complete.
Our Comment:

It is true. We didn't know the work of (Fileto, 2013). To be fair with the work of Gil and Geoinfo conference, however, we have decided to cite both papers.

 "In Figure 1 the specialization symbol seems to be wrong. From the model,
"Stay" is a specialization of "visit"."
Our Comment:
Fixed.

The detection of stays "by isolation", from GPS data, is not convincing. From my experience, in more than 99,9% this is noise. Did you find at least one real case where an isolated point was not noise? For sure, if this point was obtained from Twitter or Instagram it will be a stay.
Our Comment:
The detection of stays based in isolated points involves a set of steps. First, the stays are not based in a single point, but in a cluster of points; second, the stays are generated after the outliers removal step, as described in section 5 "Rebuilding Travel Histories", paragraph 7. We cite here the text in the article.
"Outliers are treated during the pre-processing phase of the reconstruction process. Most outliers are disregarded based on the physical unviability for a traveler being at a certain place, considering, for example, the maximum speed of known transportation means. Other aspects considered during the outliers detection process is the transportation means continuity. It is not usual that a traveler changes from transportation alternately several times. In these case, the segment that does not fit in in the average pattern is replaced by the most recurrent one. At the end, all the outliers are disregarded from the dataset and are not used in the reconstruction process."

Yes, we found cases where the isolated point were not noise, and, in these cases, they were essential to describe the trajectory. It is important to emphasize that the isolated point strategy is only applied after the removal of outliers.

Reviewer´s comment:
Comparing Figures 5 and 7, a stay is missing in segment 3 of Figure 7.
Our Comment:
Fixed.

Reviewer´s comment:
The paper does not reference any other similar software or tool.
Our Comment:
The last phrase of the first paragraph of section 6 says: "The tool used to present the graphical realization of the trip was not evaluated."

The point here is that the developed tool was built as a proof of concept. Our main goal in this paper was to instantiate the model with real case scenarios and evaluate the level of satisfaction of the participants. We have decided to add the following statement at the end of the first paragraph of section 6 to clarify the point made by the reviewer.

"To the best of our knowledge, however, there is no application or tool that reconstructs the path of travelers based on their social footprints in an automatic fashion. "

Reviewer´s comment:
In section 5: "Instagram and Tweet" --> "Instagram and Twitter"
Our Comment:
Fixed.

Reviewer´s comment:
in section 6: "transport means" --> "transportation means"
Our Comment:
Fixed.

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Reviewer´s comment:
Abstract
- A brief motivation about the problem is important in the abstract.
Instead, the contribution of the paper is initially provided. For instance:

why trajectory reconstruction is important?
Our comment:
We added the following text to the abstract.
"Travel specialized websites have increased its sociability and usage by adopting mechanisms that facilitates content sharing in real time between users. These web applications, however, lack tools that allow travelers to share their experiences, places to visit, itineraries recommendations, and other activities of a typical touristic trip. Structured and semantic data based on recommended trips, routes and destinations usually require high effort to be generated. These data when available are insufficient and incomplete. This makes the extraction of knowledge necessary for managers and consumers more cumbersome, inaccurate, and time-consuming."

Reviewer´s comment:
Introduction
- The subject matters appear not be linked. First paragraph describes the usage of OSN and UGC, while the second one explains the importance of context regarded to the user position. Thus, the question is: how these two matters can cooperate for producing a trajectory reconstruction? This is not linked. I think that another paragraph is necessary, which is responsible for describing, or providing an example about, as the influence of OSN together with context of the location could provide a trajectory reconstruction;
Our comment:
We agree that a wrap up paragraph is missing. Thus, we added the following paragraph.
"The growing habit of travelers using social networks as a mechanism to publish georeferenced events and information about their travels combined with the large number of devices able to capture the user position at different levels of granularity opens the possibility to rebuild, in an automatic fashion, the complete traveler history, including paths performed, places visited, means of transportation used and even personal impressions and opinions regarding the points of interest and the recommended way to go between two places."

Reviewer´s comment:
- There is a paragraph about Travel History (the proposed model), however, the main contributions of the paper were not stated, but should be.

Our comment:
We add the following phrase to the end of the fourth paragraph "The proposal of a generic conceptual model for describing travels based on heterogeneous sources of information, together with the presentation of a data model, a methodology, and algorithms that use multivariate digital footprints in the reconstruction of semantic-rich travelers´ trajectories helps to fill a gap in trajectory analysis of the tourism domain."

Reviewer´s comment:
Related work
- Many related work have more than three years from now. Since this topic has attracted attentions in recent years, I suggest the investigation of newer papers related to this topic;
- On the other hand, the authors referenced important papers, such as Spaccapietra et al. (2008) and Andrienko (2007).
Our comments:
Based on some reviewers´ comments, we have added already some references to the paper. We believe that our references cover the most important papers that had influenced our work. Certainly, there are several more recent papers related to this subject, but we consider that an expansion on the related work section will demand an unreasonable amount of time. We expected that our references will be considered at least adequate for this paper.

Reviewer´s comment:
The Model
The model needs more detail.
- What is the value threshold for identifying a Stay?
- Why the change of transportation mode represents a Stay? Furthermore, in which context this is important?
- What kind of information are being considered for semantic? There is an association of a particular Stay to the Home/Work? Do you label the trip?
- Do the users provide the semantic information, or the system is able to discover them automatically?
- In addition to the usage of Google Takeout, should not use Google Places or Foursquare also?
- How the system handles the changing of transportation mode? Does the user need to inform this changing to the system?

Our Comment:

Concerning Google Places and Foursquare:

Of course, it is possible to use Foursquare and any other similar technology. Travel History is generic enough to accommodate different sources of social footprints. We have selected few but different sources of information as proof of concept.

Google Places, on the other hand, is a service/API to retrieve information about places and does not provide information about people's movements that could be used to reconstruct their trajectories. We do use Google places API in the last phase of our reconstruction process but it is used to retrieve semantic information about a Stay, like name and description, when it was not available in the sources that the user has provided.

Concerning the transportation mode:

The user does not need to inform the transportation mode. The transportation mode is detected automatically considering several aspects, as we described in section 5 "Rebuilding Travel Histories", paragraph 5.

"The definition of the transportation mode takes into account the following aspects: speed, speed variation, acceleration, orientation variation and continuity. Each transportation mode has a single combination of these factors. By taking them together, it is possible to infer how the Traveler moved between Stays."

Nevertheless, the evaluation of the transportation mode detection had the lower average among all features evaluate in our experiment. We point out this deficiency in the paper and suggested improvements in the transportation mode detection as future work.

Concerning algorithms/raw text:

We agree with the reviewer comment that algorithms are more suitable for presenting some aspects of the model. We have decided to keep the text version, however, because changing the way we present these aspects will demand a new rewriting, increasing considerably the length of the paper.

We hope the textual version is precise and unambiguous enough to be used in lieu of the algorithmic version.

Experimental evaluation
- How many trips have been used for building the dataset?
- How the related work check the result of trip reconstruction? Do they allow the users to evaluate the results?
- Instead of allowing the user the possibility to assess the result of the system (by giving a grade to the output), the authors should receive the correct travel, remove some part of it (for testing stage) and check whether the result is the same (or similar) to the original one. I think this way is stronger than allowing the assessment by the user;
- The authors used import aspects for assessing their system.

Our Comment:
It was only one trip per volunteer, thus we got a total of 23 trips, considering that only 23 travelers completed the entire process successfully.
In fact, we did not find any travel history reconstruction model/tool in the related work as we cited on section 2 "Related work". The related works focused in extract information and relevant point from GPS data and social networks. Some proposed a solution to use this data to plan trips, but in a very limited way, like only in a city and using data inputted manually by travel experts.

The suggestion to compare the travels is a good idea but face some potential issues: the original travel normally is not documented. To receive the "correct travel" from travelers we would have to ask them to write it in a structured way all details of their trip, including places, times, posts they have made, media they have posted, and the location of places they have visited. We believe that the volunteers will not have the information nor the goodwill to write it down. Moreover, we believe that travelers are the best people to evaluated the result of a travel reconstruction they have made. In this way, we can say that the most important metric of the model evaluation is the user satisfaction with some aspects of the travel reconstruction process.

Reviewer´s comment:
Text needs improvement (Examples)

- "A Place is a geographic location plus some semantic incorporated" -> "A Place is considered as a geographic location together with semantic information"
- "This place is represented as a Stay only because the change in the transportation mode" -> "This place is considered as a Stay, since a change in the transportation mode was detected".
Our Comment:
Fixed.