CO-006

An Investigation On the Dynamic Relation between the Feeling Flow and the Stochastic Event Occurrence

情流と確率的事象発生の動的関係について

Mikio Sasaki †
笹木 美樹男 †

1. Introduction

I will investigate the dynamic relation between the feeling flow and the stochastic event occurrence in the various fields which can contribute to the smart IoT and the human life. As I have introduced in the last year's presentation [1][2], FFLOW (Feeling Flow) and the Environment Values are the source of the moving demands and some spatio-temporal arrangements of them will make the PFLOW (People Flow) very smooth. Moreover, they would not lose the comfort degree which has been expected initially. In this paper, we show the experimental mediator system for moving demand prediction can recommend the spatio-temporal trajectories and favorable landmarks considering the user's visual feeling from the HMI panel, on the basis of the specialized feature confidence vector set MOVER.

2. Related Work

The integrated scheme of moving demand by using the form of environment values for multiple categories of landmarks has been proposed [1][2]. It has become possible to seek the optimum solutions for the users to select the most convenient trajectory on the basis of connected and autonomous technologies for vehicles. Then the prediction of the various EV (environment values) and the recommendation of them on the basis of the specialized definition of feature vectors MOVER. By using MOVER we can define user profiles and landmark profiles. Also we can seek the user model and landmark models as the weighting coefficient matrices on MOVER. According to the concept that can simplify the EV and extend it for the expression of comfort, we can make the clear architecture for moving demand predictions.

Secondly, the PFLOW (people flow) based simplification of environment values and related city structures are described. Finally MOVER based landmarks recommendations are shown using the new concept of FFLOW (feeling flow) with simple examples. Social collaborative filtering by trust is also proposed without waiting them to become a big database [3]

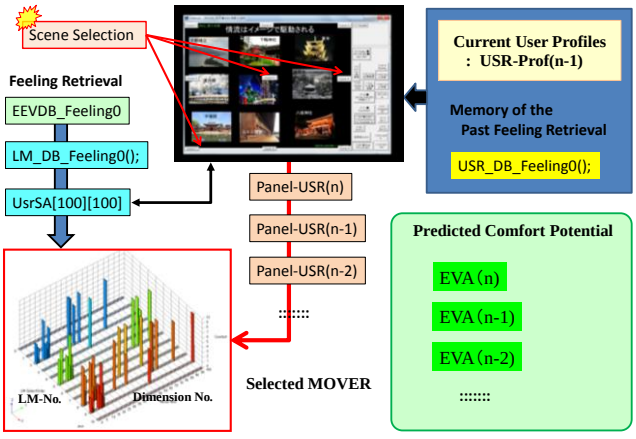

Figure 1 Real time acquisition of user's demand.

† Music Scene Research

3. Moving Demand Prediction

3.1 When scene activates feeling flow

A physical PFLOW is activated by the feeling flow based on human consciousness. On one hand, the FFLOW is affected by the PFLOW. For example, congestion and jam will introduce discomfort in FFLOW and soon, the FFLOW will change the PFLOW. Therefore, PFLOW and FFLOW will form the loop structure to change the PFLOW as the physical phenomena. On the other hand, FFLOW will not have space jam and congestion because the FFLOW itself does not physically exist. In turn, it easily be propagated from person to person and sometimes it generates the copy. The media is the sensing experiences generated by moving demands on the PFLOW including IoT devices and conversation, voice, weather, temperature, and other PFLOWs. Moreover, FFLOW will not be restricted by the physical restrictions and it sometimes will survive in a virtual spatio-temporal space. Figure 1 shows the real time acquisition process in the current experimental system which includes the evolution process (Figure 2). By using the latest database and the sensitive descriptions in the profiles, it is expected to follow the real time selection inputs and to adapt them to the web based brand-new changes of the trend.

We can consider the three steps approach to the activation of the PFLOW.

Phase-0: when the problems definition of moving demands is ambiguous and the gap between FFLOW and PFLOW is large, the following "feeling" becomes dominant in the activation of the PFLOW. At this stage, vague images affects very much when seeing at the signage and advertisement.

Phase-1: the emotion intervenes with the feeling and more realistic images are effective in mind. At this stage, new sightseeing menu found in sightseeing 2.0 and pattern analysis and retrieval and the analogy of the past historical geographical events will be executable according to the machine information processing capabilities.

Phase-2: moving demand will become dominant more and more, accordingly, proceed to the stage just before the decision of PFLOW activation.

This time, although it is restricted to the moving demand, other decisions for moving requirements and the behavior occurrence will pass the stages like above. The common points are that the embodiment process of decision by using FFLOW by way of virtual world. Although these are the simulation of FFLOW and

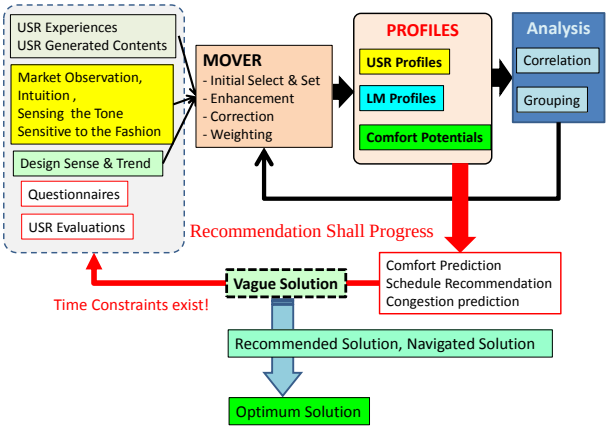

Figure 2 Evolution process.

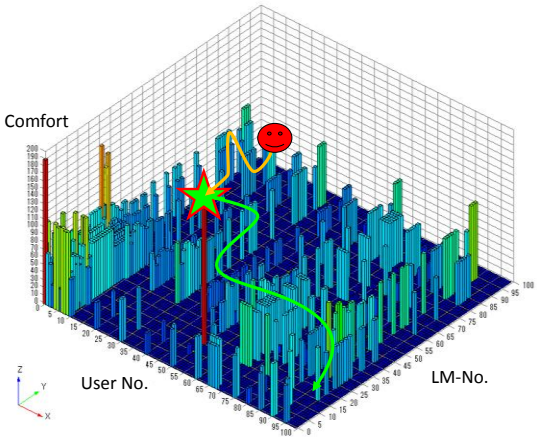

Figure 3 Concept of trajectory creation.

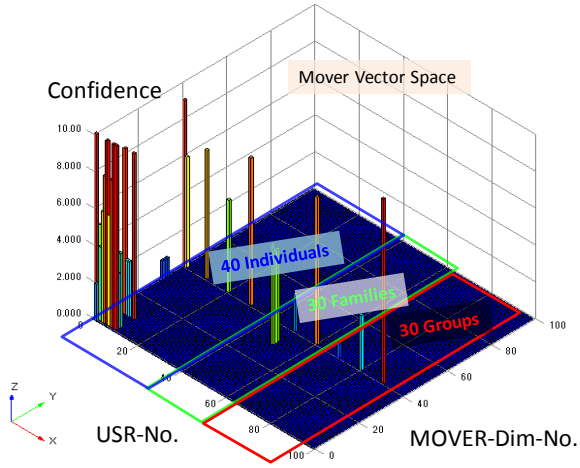

Figure 4 User descriptions.

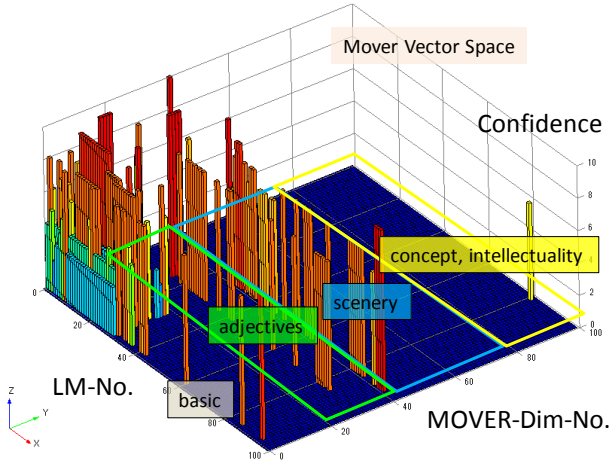

Figure 5 Landmark descriptions.

PFLOW by machine, when PFLOW is completed inside the machine, we can expect that it will provide the PFLOW creation process in the near future.

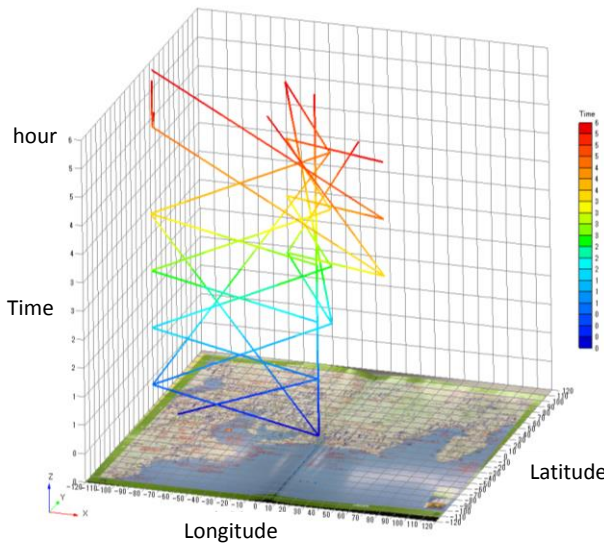

Figure 6 An example of recommended schedule.

3.2 When feeling flow activates various demands

Usually, most of the roads and parking lots around the famous popular LMs will have congestions if you go there by your own cars. After switching to walk, you will not need to wait so long. On the other hand, the route to get back home by cars will also have heavy jam. This point is common in shopping mall access problems. Therefore the same kind of feeling flow activates various demands.

3.3 Moving demand creation

As Figure 1 shows, the scene based selection of LM creates the time series of activation of “where you would like to go” and also makes the scene based descriptions as moving demands in a simulated story. According to the user profiles, there are three variations in a MOVER status such as “Nothing changed”, “Virtually changed”, and “Inducement by visual scene”. Then, planning occurs by using LM profiles when the selection of the story which will make the comfort maximized.

3.3.1 User description

In our moving demand prediction system, we have been proposing MOVER vectors based user description which includes 100 dimensions of numerical confidence (MOVER

vector) which express the user's moving demand. We use specific descriptions of users by sentence and keywords. These numeric and language expressions are completely separated and easily combined when the simulation starts.

3.4 Comfort potential

Fundamental feature dimensions (in this paper, one hundred) are defined on MOVER. The weighting coefficient matrix W expresses the personal model and the landmark model. For different person, the convergence of the models is difficult. The connected mechanism can be used for the mediator to get the collective intelligence [4]. The comfort degree does not necessarily depend on some special place or landmark. As the plural different landmarks are common in view of the comfort degree, feeling retrievals become possible. These potential factors are to be restricted using trustee network, grouping, factor analysis, and matrix factorization, etc. Therefore, the machine can recommend different spatio-temporal trajectories according to the hypothesis that FFLOW will maximize the comfort. The comfort potential is defined as follows:

$$E=U_D U_S^T=W(U_D,W_D)\ W(U_S,W_S)^T$$
$$where,\ [W(A,B)]_{ij}=[A]_{ij}[B]_{ij}$$

Features of 100 people（Movers）on MOVER and features of 100 LMs on MOVER will enable us to compute the comfort (Figure 3) which automatically create moving trajectories.

3.5 User profile

In order to model the FFLOW generation structure, language-based user descriptions above are used semantically. In turn, numerically, grouping of user profiles according to the correlation value more than the threshold (for example 60.0) is also introduced with the top down classification of 100 users as shown in Figure 4. Correlation value between different profiles is calculated by using the inner product of MOVER vectors.

3.6 Landmark profile

In order to model the FFLOW induction structure, grouping of landmark profiles according to the correlation value more than the threshold (for example 60.0) is introduced as shown in Figure 5. Correlation value between different profiles is calculated by using the inner product of MOVER vector.

3.7 Grouping of profiles

Through the use of comfort potential, machine can generate the unknown moving trajectory from the current time. The comfort degree can be calculated from the following definition.

In the comfort matrix E, the diagonal components do not necessarily take high value. It is the simply search process for high correlation values line by line. By taking two directions of row and column, we can make two different sets of groups as follows:

$$G(U_k)=\{L^k_{j1},L^k_{j2},\ldots,L^k_{jN(k)}\},\ G(L_j)=\{U^j_{k1},U^j_{k2},\ldots,U^j_{kM(j)}\}$$

where, U_k is kth user corresponding to kth column in comfort potential matrix E. L_j is jth landmark corresponding to jth row in E. L^k_{jn} is jnth landmark of E included in the group $G(U_k)$. U^j_{km} is kmth user of E included in the group $G(L_j)$.

3.8 Trajectory creation

Now, according to the event $\{U_k, L_j\}$ which maximize the comfort potential, the machine can create the feeling trajectory as shown by Figure 6. This is practically performed according to the following process: Step-1) To generate the FFLOW trajectory on the basis of the special event set $\{U_k, L_j\}$ which maximize the predicted comfort potential. Step-2) As the result of the consideration of capacities and schedules of users and landmarks, if some troubles are anticipated on the FFLOW trajectory, the following plural strategies will be concurrently evaluated: Strategy-1) To generate sub-streams, Strategy-2) To exchange the time series among the users schedule, Strategy-3) To exchange the group members between different groups, Strategy-4) To exchange the LMs in view of the nearest MOVER vectors, Strategy-5) To exchange the moving demand themes subject to the nearest comfort potentials.

Therefore the machine can change and evolve the dream of plans dynamically. Step-3) To embody the created plans above by using the proactive navigation of users so as to avoid the assumed troubles and congestions in advance.

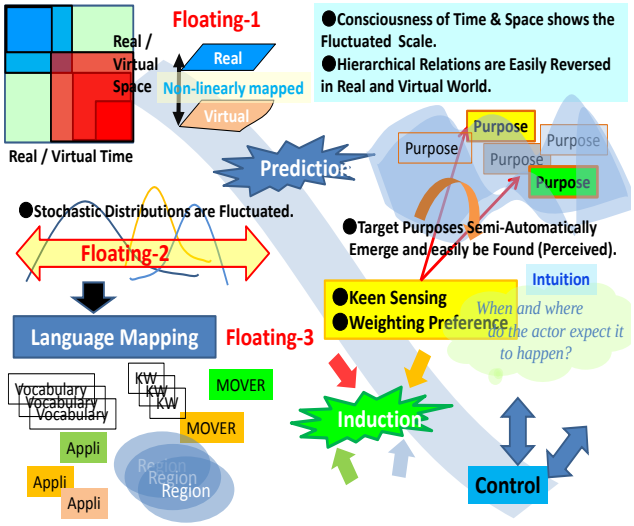

Figure 7 Floating confidence.

4. Floating Confidence

4.1 Concept

On the edge of the real time discriminations of the stochastic situations on MOVER space, we can assume "the actor" who is just about to focus on the omen of the occurrence of the targeted event. This kind of "special scene" emerges as the spatio-temporal changes of {FFLOW, sense, safety, information, danger, value of things, money, perception of time, MOVER selection and adaptation, feeling retrieval within the same MOVER, feeling retrieval over the different MOVERs, etc.}.

Numerically, these factors will cause the targeted confidence vectors being induced easily by some specific human (including "the actor" himself) operations (weighting, concentration, looking, filtering, rating, etc.) to output different results, while watching surrounding various "other possible spatio-temporal regions" as well. Namely, "the actor" can feel the spatio-temporal geometry surrounding the target holes as the "grooves" as the result of the concentration.

Semantically, the same effects are caused by the language level of matching. In this paper, I call this fluctuating property the Floating Confidence (FC).

4.2 Three levels of FC

As Figure 7 shows, we can assume three layers of FC. Floating-1 is the hierarchical reversal in a user's consciousness and sensing caused by the focusing and spatio-temporal movements either in real or virtual world. Floating-2 is the fluctuation of the stochastic distributions on every event for a user. Floating-3 is the language mapping between different continuous phenomena.

4.3 Three aspects in FC

Also, we can consider at least three major aspects in FC such as Prediction [5], Induction, and Control [6]. Every aspect needs the keen sensing and observations under the condition of specified spatio-temporal restrictions. If the actor targets the single purpose, it would be very rare to attain the stationary performance for the prediction. If some active means for the statistics exists, the actor's purpose can be dynamically organized from the realistic view of applications. So the actor can integrate dynamically the other domain, he would be able to have relatively good accuracy of real time prediction.

4.4 Benefits of FC

In order to predict the moving demands within the specified time, especially for the real world, vagueness always exists under the realistic constraints. FC will reify the ideal moving status by connecting the MOVER and the real resources. Also FC will clear the most important restrictions "in time fulfillment" and achieve "more than the minimum accuracy expected" like the entrance examinations, elections, etc.

4.5 Spatio-temporal state transition in the MOVER feature vector space

We can express the hierarchical relations between the actor's different status nodes which practically use graph architecture. This will enable the same actor to define the major statues and sub-statuses while permitting the different MOVERs can be easily mixed dynamically. Usually, the major status is defined around the current actor's spatio-temporal region. But when the actor is absorbed in special or virtual region, it would become the major status and the others are declined to the lower dimensions.

There are three floating properties in this architecture according to the concept of the FC described above. The first one (Floating-1) is the continuous but randomly moving natures between different layers on the basis of above hierarchical relations. The second property (Floating-2) is the stochastic distributions of the spatio-temporal regions are relatively easily fluctuated by some force although have some coherency, namely it is not solid. The third point (Floating-3) is that the mapping between the MOVER spaces and the language descriptions are not definite. This means the MOVER itself does not have the solicit dictionaries but has some "geometrical interpretations" which might express the generic properties of human sense, partly they are defined by some adjectives (smart, easy, soft, great, beautiful, clean, pretty, comfortable, holly, sophisticated, historical, melodious, pop, etc.).

Therefore the solutions of MOVER related problems become inevitably vague. But it can be fairy solved at the high accuracies within the restriction of the existing time by using keen sensing of the users and user experiences, not by "supernatural powers" but by sophisticated observations and trainings. We can see many pragmatic examples around music, sports, art, designs, literatures, and other human related sensing and emotions.

These ideas of the accuracy and attainment based evaluations of the system capabilities have not been well accepted so far in the natural science domain. Therefore we need new criterion.

5. Experiments

Three major experiments are undergoing and partly be finished.

A) Dynamic estimation of feeling flow for panel users.

B) Concurrent recommendations for 100 users and 100 LMs when considering the web based evolution.

C) Feeling retrieval effects under the profile based database.

6. Investigations

At the end of May 2018, more than 60% of accuracies for the comfort degrees were verified in my experiences based DB and the questionnaires from 30 people which are manually converted to the MOVER vectors.

7. Conclusion

The dynamic relation between the FFLOW and the stochastic event occurrence has been utilized to extend the moving demand prediction mechanism in three ways. First one is the real time acquisition of the user's demand by scene based presentation and descriptions. Second one is the dynamic evolution architecture of the database which can follow the brand-new trend before the big data accumulated. Third one is the new concept "floating confidence" which will raise the accuracy of the vague solutions for the related predictions. Next, I would like to try these mediator based intelligent concepts to various application fields other than the sightseeing recommendation.

Acknowledgement

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Reference

[1] M. Sasaki, "On Generic Properties of Extended Environment Values", *ITS World Congress 2017*, Montreal, Oct. 2017.

[2] M. Sasaki, "When Feeling Flow Activates People Flow", *FIT 2017*.

[3] Bo Yang, et al., "Social Collaborative Filtering by Trust", *IEEE PAMI*, Jul. 2017.

[4] M. Sasaki, "The Estimated Truth will Evolve on Neuro-ITS", *ITS World Congress 2014*, Detroit, Sep. 2014.

[5] M. Sasaki, Y. Sekimoto, "Towards Risk Prediction Considering People Flow", *ITS World Congress 2014*, Detroit, Sep. 2014.

[6] N. Ueda, F. Naya, H. Shimizu, T. Iwata, M. Okawa, H. Sawada, "Real-time and Proactive Navigation via Spatio-temporal Prediction", *Proc. Of the First International Workshop on smart Cities: People, Technology and Data, in conjunction with Ubicomp2015*, pp.1559-1566, Osaka, Japan, Sept. 2015.