



HAL
open science

From the expansion of the space of the displacements towards the transformations of the plane

Edern Ollivier

► **To cite this version:**

Edern Ollivier. From the expansion of the space of the displacements towards the transformations of the plane: A pool of trajectories for the engineers of the automation of the fair and automated vehicle. 2021. hal-03335352v3

HAL Id: hal-03335352

<https://hal.science/hal-03335352v3>

Preprint submitted on 12 Dec 2021 (v3), last revised 19 Jan 2023 (v8)

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

1234

From the expansion of the space of the displacements towards the transformations of the plane

Edern Ollivier

*Member, IEEE, edern.ollivier.fr@ieee.org, 17 RUE DE L'AMIRAL HAMELIN at Paris
16 (75116)*

Abstract

The odometric model gives the place to a space of displacements. We have been resolving to simulate, integrate, explain and then to validate the odometric model. The model of resolution is to be programmed in the Maple langage, with the help of a solver for Maple 2021.

Introduction

As one introduction, I could say that the odometric model is well known now and that everything is done for the space of displacements of a model of automation to be improved with the odometric model.

1. Lemma

There is the convergence of the odometric model with the absolute convergence until an hypergeometric function with a gamma, and moreover all this space of displacements has a structure K-completed of a group, with the neutral element that is the rotation of an angle of 2π modulo π .

$$f(t) = \int_0^t \cos(x)^I dx$$

$$\Gamma(1/2 + I/2) \cdot \sqrt{\pi} / (2 \cdot \Gamma(1 + I/2)) = f(\pi/2) = \int_0^{\pi/2} \cos(x)^I dx$$

2. Proof of the lemma

On one hand the space of displacements is a subgroup of the space of the transformations of the plane implies that each element of the space of displacements is the limit of a series of elements of this space of displacements. And another hand for each element of this space of displacements there exists a bounded sequence for any displacements, cf. the work of Guillaume Artus on the slavings to be given to the computer to make a robot go from one position to another in the plane [1], in the space of the displacements such that the limit belongs to this space of the displacements of the plane implies that the space of the displacements is completed in the body of the transformations of the plane.

3. Explanations about the lemma

The lemma has been fully proved so that now we can access the datas from the first series with the linearized functions in the matrix of state and measured, given by the chinese team in a paper published by the IEEE editor, I have done the primary effort to the state matrix of functions, nevertheless they did the last one to ensure the compatibility of the odometric model with the mathematical background of mine and also to get the values with the vehicle [2].

4. Example about the lemma

The best effort example is the half turn like maneuver. In the space of the displacements there are two arcs of circle to do for instance, instead of a rotation of Pi in the space of the transformations in the plane, and usually its can be done for more figures of maneuver with the homothety, or even with the translation.

5. Conclusion

As one conclusion, I could say that the odometric model is well known now and that everything is done for the commands of a model of automation to be validated with the odometric model [3]. I should also emphase that a thesis can be done with the first issue of mine about the so called linearization of the equations of the odometric model given back by the issue of the chinese team of researchers [2]. ————— 1. Guillaume Artus, Pascal

Morin, Claude Samson. Control of a maneuvering mobile robot by the transverse function approach : control design and simulation results. [Research Report] RR-5155, INRIA. 2004, pp.16. [⟨inria-00077042⟩](#) ; 2. Xiaocong Su, Chaoyong Zhang, Duanfeng Chu, Shidong Liu, Deng, and Chaozhong Wu, Trajectory Planning and Tracking for Autonomous Vehicle Based On State Lattice And Model Predictive Lattice, IEEE Intelligent Transportation Systems Magazine (Volume 11, Issue 2, Summer 2019) ; 3. Edern Ollivier. Simulation, integration and explanation of the odometric model for the purpose of the numerical analysis: A pool of trajectories for the engineers of the automation of the fair and automated vehicle. 2019. [⟨hal-02162501v8⟩](#) ;
