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Modeling of Vehicle Drive through a Turning Passage in Real Environment

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Abstract—This project is carring out of design and development of software which is able to determine the ideal method of passing cars sweep so that the car is capable of a corner as quickly as possible without compromising safety to crew, or there is a deterioration in passenger comfort, or damage to tangible property transported. Thus a virtual model of a situation such as a desktop application programming in Microsoft Visual Studio 2008 was created. Thanks to the user who made aplication used as an example of automated driving. At the same time it can become the basis for further work on this topic.

Keywords - key virtual model, desktop application, automated management, C#

1. Introduction

When driving the vehicle the driver is responsible for a number of operations that affect vehicle performance. The driver then adjusts the type of road, which goes on. All these operations are carried out subconsciously based on the experience gained through practical work. The driver is also under various conditions. Conditions as the quality of the road, speed or weather conditions are not the only factor. Another important factor is the number of journeys by the place. It's all very clear that the road out front, the driver behaves differently than on-site, or in a place notorious for the high accident rate. The task was to understand these processes and at least to emulate it. At such a level that can be solved by using the basic activities in this area and to comply with predetermined conditions. It is important to realize that achieving control is so advanced, such as human activity. It is not impossible to learn from, which creates a problem to be addressed. However, a program that addresses the validity of the information leverages, processing and storage is so difficult (not impossible) that this part of the problem is not addressed or taken into account. Similar projects are now processed by the European Union. In an effort to reduce traffic accidents and deaths from accidents [1 "]. Smart car with electronics of the future will be able to communicate with other vehicles as well as its transport infrastructure and facilities, ie roads, bridges, traffic lights. It will check the distance from other vehicles on the radar, automatically identify traffic signs, automates the jog in heavy traffic, etc. The vehicle will collect information from its environment and evaluate them in accordance with these data help the driver control the vehicle. The machine will alert drivers to potential risks, monitor his behavior and if necessary take decisions and control the car. In the event of an accident the car itself calls for help. Some simple "smart" technology is already functioning in everyday life. These include the use of microprocessors that control the ABS anti-skid braking system or the use of airbags.

Nowadays, there are similar programs designed to simulate driving, eating the need for "tuning" and achieve optimal performance racing cars. Such a program as Cartest 4.5 [2]. CarTest is a computer simulation of the maximum acceleration of the car. The user enters a specification for the car and accelerates. CarTest calculates mathematical model of the car until it reached maximum speed. Simulation is time-and event-dependent. This means that the acceleration time is not only calculated, but rather proceeded by short

steps. The usual events that take place during acceleration: clutch, spinning wheels, shifters, etc. are done in the correct order. Acceleration time is then an arbitrary milestone, which is achieved during the reaction of the car on the project which is interesting.Next Car Dynamics Simulator [3]. The main objective of the simulation is to analyze the car and suspension movement, show the dynamic behavior depending on the obstacles and curves show the corresponding parameters given by a function of time. Modeling driving through cognitive systems [4] may contribute to research of human factors associated with driving. Network Queuing Network-Model HumanProcessor (QN-MHP) is a computational cognitive architecture developed to represent the human information processing as a front-network based upon the science of neural networks and psychological knowledge. Using similar technology called "smart cars" will help to eliminate the negative effects of human on fact when proceeding [5]. Aggressive driving has become a very common phenomenon. This underlines the importance of emotional states as factors influencing the style and driving behavior. The cars have implemented advanced support systems, to improve road safety and driver assistance.

2. Problem Definition and Related Work

The problem was to teach the meaning and size of the forces on the vehicle, which unduly influence the driving character. The main task therefore was to describe these effects qualitatively. Identify the causes and consequences. Then it is possible to reduce these impacts to acceptable levels, or even eliminate the right procedure of driving. Equally difficult is to choose one procedure, preferably an optimized process. Satisfying demands for safety, speed, ride smoothness, stability and quality control. Since the method is highly advantageous for the passage of one vehicle cornering it may be unsuitable for the passage of larger vehicles. The first vehicle misconduct may restrict or threaten moving vehicles. Another consequence is the formation of columns, which further impede the flow of traffic. This also directly affects the number of accidents, as the density of vehicles deccreases in these areas. By decreasing the time to respond and clear the situation. Then, many studies has focused on this topic. As a process aid program Mitraa, whose findings should be taken into account. [6] We used the FMV model for organization of nine identical vehicles forming a group to monitor the impact of speed changes of leading one to the vehicle group. According to the simulation results, we found that the increased frequency and magnitude of changes in leader vehicle speed, the gap between the cars was closer to sine wave. Conversely, if the change of leading vehicle speed is smaller, the gap between the cars will be larger.

These programs are used only for the design of roads and vehicles themselves. So only sticking point was resolved. On the contrary, the programs are created to address the logical and logistical problems on real routes and long distances. Accelerating the transfer of raw materials to processing sites and thereby reducing the cost of production and transportation. Thus, the final cost for the program is Hyperion. The problem here is that, [7] to perform complex modeling and analysis, you have to access to quality information and determine the impact of the expected results. You should be able to quickly and easily create a variety of operating conditions and to create alternative scenarios, which are assumptions that most affect the results. Modeling functions should allow adaptation by facilitating aggregation and analysis of individual components of a strategic plan to ensure that the results accurately reflect value.
To simulate the complex traffic situation, it is therefore important to develop a model that accurately describes what the job is. This requires a good tool for simulation. What is SILAB example, the company WIVW [8].

Under the SILAB, users can create their own scenarios. This includes the definition of road geometry, the influence of the countryside and taken control of other road users. In any case, by enabling high density and reproducibility scenarios. The order of scenarios can be proposed by any user. As a unique feature SILAB provides mechanisms for changing the order of scenarios during the simulation. It is possible to adjust the order of driver behavior.

These and other programs addressing transport problems more comprehensively and more consistently than is necessary for this project. The task of this role is the solution that can help us to make the options and restricted mainly to a specified date. There is no need to say, that these programs were created with the cooperation of many experts and at a much longer period of time. However, this simplified form provides

critical data management to cope with and understand the internal mechanisms. And at least in a form that can be called instruction.

Simplification means that not all processes will be considered as real, but as an ideal. Certain characteristics are described in a linear equation to facilitate the calculations. This simplification will be used where it is effective to result from the fact differed only minimally. Events acting on the vehicle will be considered only rarely. We are referring to brake failure, defect, a wasp in the cockpit, nausea, and drunk drivers and other matters of similar nature. Simulation of such situations is very challenging. Or you do not have enough information to allow us to be able to describe or to model. Only factors as input and output speeds, wet roads, sliding friction, intensity curves, immediate difference direction and the normal ratio of centrifugal force, inertia is considered.

3. Proposed solution

The shape of the curve or the locus of a vehicle can be approximated and described by one of the conic sections, most often hyperbole. This equation is different for each turn, so it is on the user, to ensure a variety of variations possible scenarios. The most important factor is the so-called "sharp corners", or the angle between the direction before and after passing the bend. Normally, this angle ranges between 0 ° -90 °. This angle may be greater, but it does not happen so often and not too much overlap. A large overlap is the only system of curves or switchbacks. Charcoal never exceeds 180 degrees, it does express a bend in the opposite direction. This angle then forms an hyperbola asymptotes. The next parameter is then awarded by the weight of a vehicle, since the size of the centrifugal and centripetal forces at this level is directly dependent. The last key parameter is the surface, since a coefficient of static friction between the tire and the surface. Furthermore, expanding the parameters follow a curve as a location outside the village in the municipality. Determination of centrifugal forces is as follows. Range in which the conic section corresponds trajectory equation is sampled in steps. The sequence of these points corresponds to the transit procedure. Then using the coordinates of points determined by the movement of individual differences in vehicle directives, the current and previous step. From this we learn the difference between directives change of pace in this direction. In equation it means maximum possible speed in the first step is a predetermined value, in the other it may change depending on conditions. Acceleration is then. Where T is sampling time. Using the formula we determine the centrifugal force.

We determine the size of centripetal force by multiplying the coefficient of static friction surfaces and the corresponding weight of the vehicle. This is the maximum amount of centripetal force. Which can be developed by vehicle.

To pass the correct size of the centrifugal force it is always less than the maximum centripetal force. Otherwise, pass the static friction dynamic friction, whose size is much smaller. In other words, the car goes into a skid.

4. Implementation of Proposed Solution

The resulting product determines the maximum speed achievable by the given conditions. The method is not analytical. Or, not just a simple calculation of the limits or maximums. The product was created in 2010 expres.nostandard VisualStudion environment, component is zedGraph. Private classes are reset, edit, Pythagoras updategraph1, updategraph2, determine the procedure consists of repeated simulation. Delivering to the intended method. This method gradually seeks first state where it is possible to reliably say that under these conditions it is not possible to properly and safely traversed by the proposed curve. Then, the previous value of speed, the speed of previous simulations, the maximum declared and handed to the next method responsible for rendering the forces acting on the vehicle during the simulation. Then the maximum value was adjusted to the tolerance of human error, since the driver is unable to go to reach a constant speed or velocity with absolute precision. This will prevent unnecessary accidents. The last step is to re-adapt to environmental drivers. Since it is clear that passing the bend in the community rate that is less than optimal, but it violates the speed limit. Then, the function displays advice for managing the situation. It is then ready for the next simulation.

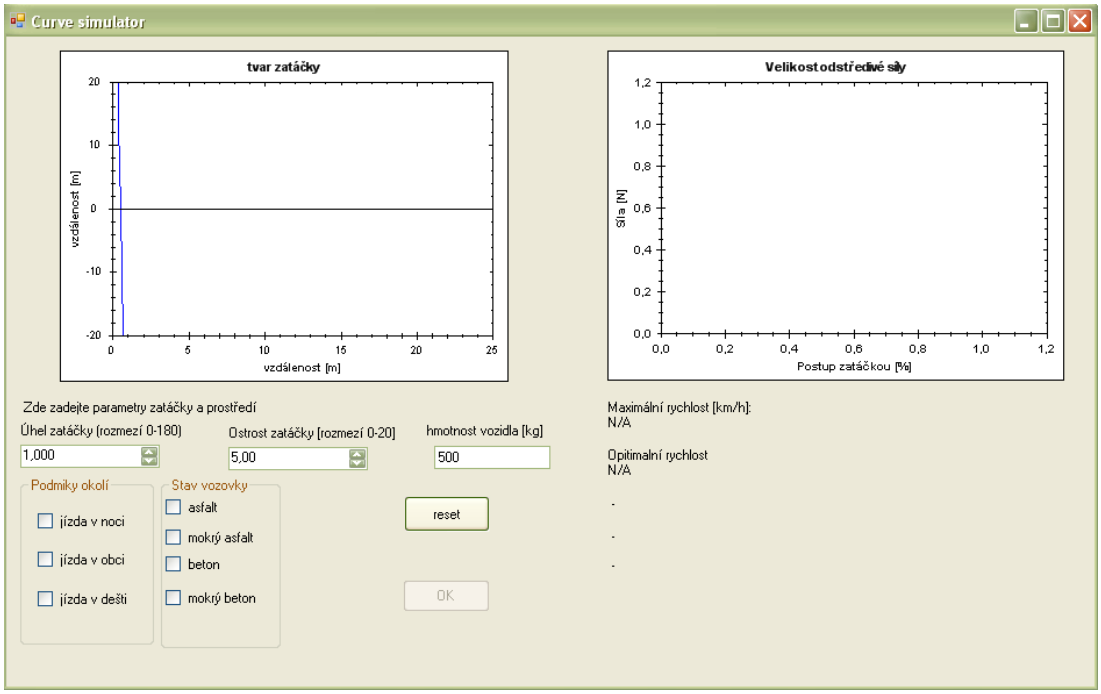

Fig. 1 Environment Programme

We choose to describe a generic example. To determine the maximum speed for transit vehicles weighing 1,500 kg, a bend angle of 30 degrees, the bend radius of 12m, the rain, at night, the asphalt road within a municipality. Sharpness determine a radius of 20, 20 to 12 = 8, of which This is due to the maximum feasible radius is 20m.

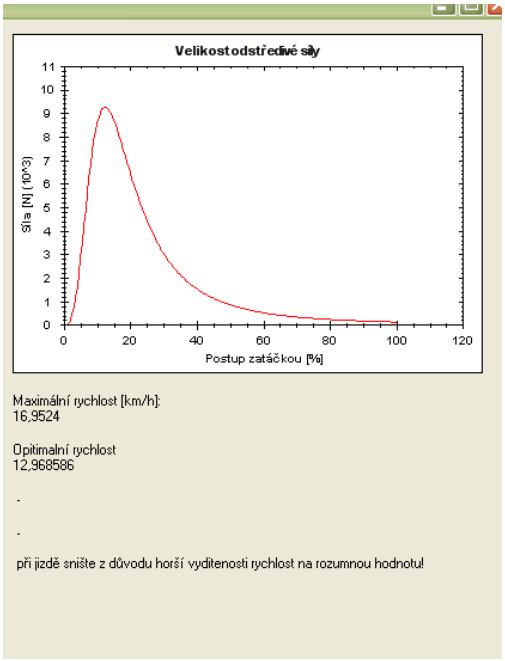

Fig. 2 Environment Programme

The program then evaluated as follows. Driver should not exceed a speed of 13 km / h and should be aware of impaired visibility. It is seen that the greatest danger is the first and second decimal corners.

5. Conclusions

On this project we tried to work with sophisticated graphics, so for me it had a high added value, at least in new orders and the discovery of unsuspected dimensions provided on such a platform. At the same time benefit from education is a new programming language C #, continuing to work in C and C + +, practical way requiring effort and self-study. It is sad that they failed to model the situation so perfectly match the real situations. However, its purpose served in the case of methods of modelling and understanding of their actual use in the real world.

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7. References / Reference

[1] J. Pindor, M. Penhaker, M. Augustynek, D. Korpas, Detection of ECG Significant Waves for Biventricular Pacing Treatment. In 2010 The 2nd International Conference on Telecom Technology and Applications, ICTTA 2010. March 19-21, 2010, Bali Island, Indonesia, Volume 2, 2010, p. 164–167. DOI: 10.1109/ICCEA.2010.186

[2] O. Krejcar, R. Frischer, Detection of Internal Defects of Material on the Basis of Performance Spectral Density Analysis, Journal of Vibroengineering, 2010 – Vol. 12, No. 4 - P. 541-551.

[3] P. Tucnik, Optimization of Automated Trading System's Interaction with Market Environment, 9th International Conference on Business Informatics Research, Univ. Rostock, Rostock, Germany, Lecture Notes in Business Information Processing, 2010, Vol. 64, pp. 55-61

[4] BI LU-ZHENG,LIU,YI-LI.: *COMPUTATIONAL COGNITIVE ARCHITECTURE FOR HUMAN INFORMATION PROCESING,PROCEEDINGS OF 2009 INTERNATIONAL CONFERENCE ON MACHINE LEARNING AND CYBERNETICS, VOLS 1-6* , Pages: 895-900 Published: 2009,ISBN: 978-1-4244-4705-3

[5] MAAG CHRISTIAN, MARK CHRISTIAN,KRUEGER HANS-PETER.*: AGENT AND MULTI-AGENT SYSTEMS: TECHNOLOGIES AND APPLICATIONS, PT II, PROCEEDINGS* BookSeries:Lecture Notes in ArtificialIntelligence Volume: 6071 Pages: 242-251 Published: 2010 9743 ISBN: 978-3-642-13540-8

[6] WANG, W., D.KOBAYASI and N.ITAKURA, etal. (2004), *Applyingtheassemblingmethodof thedriving model usingimaginarypreceding vehicle on themicroscopicroadtraffic simulator (MITRAM)*, Joint 2nd International Conference on Soft Computing and Intelligent Systems and 5th International Symposium on AdvancedIntelligent Systems (SCIS & ISIS 2004).

[7] P. Mikulecky, Remarks on Ubiquitous Intelligent Supportive Spaces, 15th American Conference on Applied Mathematics/International Conference on Computational and Information Science, Univ Houston, Houston, TX, 2009, pp. 523-528, ISBN: 978-960-474-071-0

[8] *O. Krejcar, Prob*lem Solving of Low Data Throughput on Mobile Devices by Artefacts Prebuffering. *EURASIP Journal on Wireless Communications and Networking*, 2009, Article ID 802523, 8 pages. Hindawi publishing corp., New York, USA, DOI 10.1155/2009/802523

[9] M. Augustynek, M. Penhaker, D. Korpas, Controlling Peacemakers by Accelerometers. In 2010 The 2nd International Conference on Telecom Technology and Applications, ICTTA 2010. March 19-21, 2010, Bali Island, Indonesia, Volume2, 2010, p. 161–163. ISBN 978-0-7695-3982-9, DOI: 10.1109/ICCEA.2010.288

[10] O. Krejcar, R. Frischer, Non Destructive Defects Detection by Performance Spectral Density Analysis, Journal Sensors, MDPI Basel, Vol. 11, No. 3., pp. 2334-2346. (2011)

[11] O. Krejcar, J. Cajka, User Adaptation Improvement Using a Software Components for Mobile Control Systems in .NET Compact Framework, In *Proceedings of International Conference On Networking and Information Technology, ICNIT 2010,* 11. – 13. June 2010, Manila, Philippines, pp. 545-549.