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Term Paper on "A Novel Gesture Driven Fuzzy Interface System For Car Racing Game"

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Abstract:

This paper is based on define some gesture that is imitation of demotic movement. And the movement are tracked from the different types of sensors for monitoring them. Microsoft Kinect sensor pay of a human body remaining in its field of view with the facilitate of 20 joints, which is utilized for gesture recognition algorithm. With the help of knowledgeable data processing and recognition algorithms gesture input inaccuracy can be solved. Here the gesture recognition algorithm has been taken the middle field of Human-Computer interface that is how people interact with the computer. Human Computer Interaction (HCI) is the new area to achieve more intricate human machine interaction with physical feedback has been made possible by recent advanced resource, display & rendering technology. Gesture recognition is based on mimic of human vision system. The principle is differentiation the driving model presence of motion driven hustling games and its improved truth. The model which has been proposed here is Mamdani Type 1 Fuzzy Interface System. This system has been developed to give some real world environment for the simulator games. The output has been measured with respect to the skeleton movement which was responsible for key up and key down.

Keywords:

Fuzzy IF-THEN rule, Simulator game, Kinect 360 sensor, Key press, Kinect skeleton

Introduction:

Human motion is tracked by Kinect sensor which is associated with Software Development Kit (SDK). The mentioned model is of driving control for a racing game imitates the characteristics driving of an auto transmission car with two hands kept in such a place that they appear holding a non-existence controlling wheel. Where the player sits and according to the player's privilege, left feet come forward to incite increasing of speed and the same for brake. The controlling point is dictated by the point between pivot made by joining of both hand facilates and the sagittal plane.

Here the Mamdani Type 1 model has been used for supervision of "keypress duration or duration between key up and key down", which basically help to generate signal. This system is used to give the model an accurate result, different types of precise outputs. The proposed game mimics the natural driving in the simulator racing games. Here 20 body joints is used which are Head, Shoulder Centre, Shoulder left and Shoulder right, Elbow left and Elbow right, Wrist left and Wrist right, Hand left and Hand right, Spine, hip centre, hip left and hip right, knee left and knee right, ankle left and ankle right, foot left and foot right.

Body:

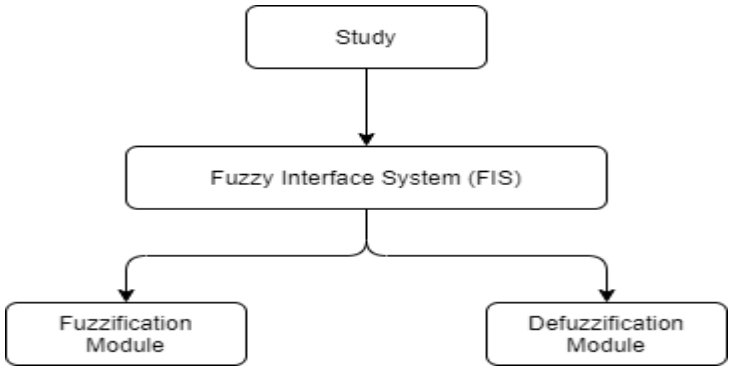
Proposed Model:

The foremost equitable of motion controlled driving is to give a smooth driving control through simple unique signal and control the speed increased and brake of car by comparatively simple motion possibly disconnected to the utilized in directing. The point produced by the straight line

interfacing two palm position that is left and right hand joint in Kinect skeleton with the sagittal plane is given as the contribution to the controlling framework alongside it sign.

The paper has been proposed a Mamdani Fuzzy interface system (FIS) for easy mathematical concept to produce the directing yield for the racing car game, which comprises of 2 information factors and one yield variable, where input 1 is angle of steering(θ) and input 2 is steering diameter(d). FIS uses the "IF-THEN" rule for more distinguishable output. The model was proposed in 1975, which works by set of some fuzzy rules and which use membership function (μ) as an input. The membership value of membership function (μ) is vary from 0 and 1. By the help of this model, the output has been generated by combining some fuzzified input based on some fuzzy "IF-THEN" rules. In this model, the output is based on combining the strength of "IF-THEN" function and the output of membership function (μ). And finally a defuzzified output that is crisp in nature has been generated and the output is Keypress duration (T). Instead of just "IF-THEN" rule, if it is used along with connector "OR-AND", it will be easy for compact output and will also easily draw the decision rules.

d = steering diameter (normalized form), θ = angle between sagittal line and two palm (steering angle).



Simply FIS consist of four obvious model.

Fig 2 – Fuzzy Interface System

The basic contribution for guiding a car in the racing game is controlling point that is the point by which the player appear to turn. The point is appeared is with assistance of a 3D picture of a major part in driving position. Here the steering input angle is -60^0 to $+60^0$ fixed.

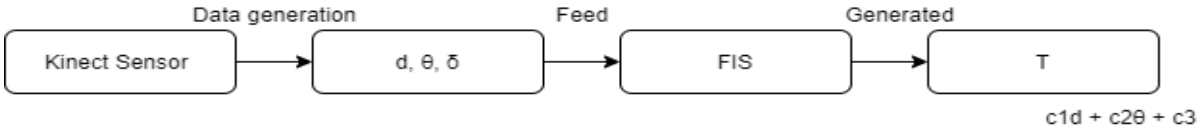


Fig 5 - How output is generated

Methodology:

Here a real time simulator racing game is used for examine productivity and smoothness of the proposed model. Due to having sufficient amount of inputs which are expressed in fashion way for moving game property. Wild tangent game is used for driving system.

An another free windows racing games “final drive fury” which require 256 MB RAM created by the Wild Tangent. Which has needful to make it more accurate like a simulator racing game. Where UP ARROW, DOWN ARROW and LEFT, RIGHT ARROW has been used for controlling acceleration, brake and steering. This “final drive fury” does not follow any condition of “Nitro Nation” or “Drift” for sensible.

Here output has been generated by ten inept player, six expert player four are familiar with this simulator racing game. Here left hand, right hand has been used for getting steering diameter. For forming the sagittal plane centre of shoulder, spine and heap has been used and for getting acceleration and left, right foot is used brake control. Here, angle has been created by sagittal plane.

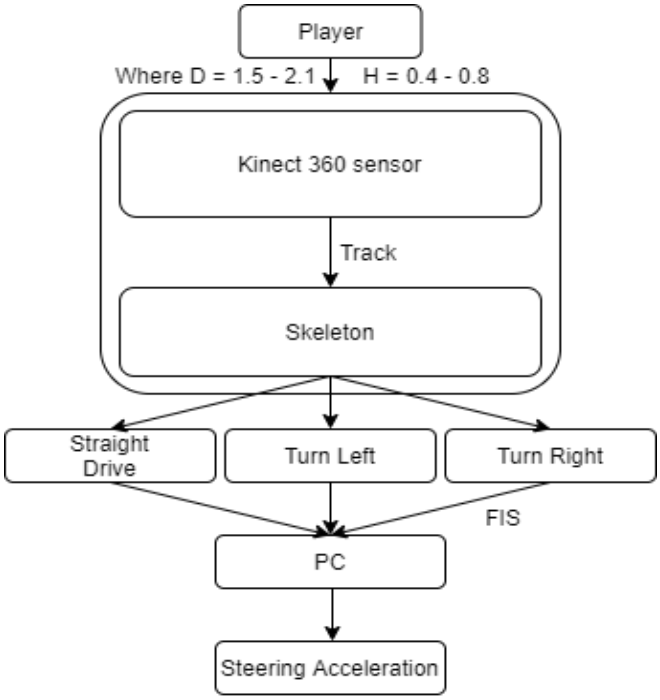


Fig 3 - How the Kinect sensor is used for the tracing motion

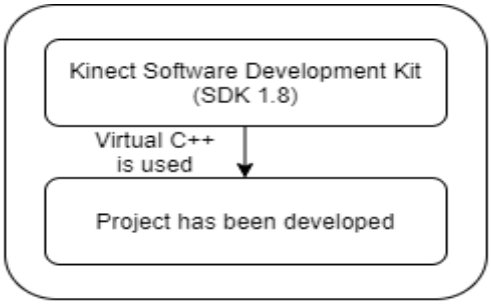


Fig 4 - How the SDK is used for developing project

IF-THEN rule:

Rule says, if d and θ movement is low, then the virtual keypress will be very low or minor. Virtual keypress becomes low if d is low and θ is medium or d is high and θ is low. Virtual keypress is medium, if d is low and θ is high or d is high and θ is medium. If d is high and θ is also high, then the virtual keypress will also be high.

The Steering Diameter Acceleration and angle:

The directing diameter, i.e. the radius of the guiding wheel, is typically fixed during a genuine driving framework; however in motion controlled driving, the simple of the said thing, the distance between two hand joints, may differ broadly. As indicated by the regular conduct of human tangible engine framework, the driver will in general turn the wheel in a more prominent point if the radius is small. So the guiding radius is likewise determined from the Kinect-followed skeleton and took care of to the FIS to ascertain the exact Key-press span. Here d and θ is being used as input function. Here, the different types of membership value parameters are used and as the Gaussian is used so the desire outcome is triangular. Scaling the output T, log function is used to make it more standard.

$$\text{Gaussian membership function, } \mu Ai(x) = \exp\left(-(c_i - x)^2 / 2\sigma_i^2\right)$$

Here, three constant values α, β, γ has been used as initial threshold function.

Result & Conclusion:

When the player sits for playing, the Kinect application track the skeleton and process the data. It consider to ignore the minor movement of 10^o as the hand and legs can have some minor movement while playing virtually. Here, a sigmoid function is used to show the necessity for precise

control in lower steering angle and sharp bend in higher ones. To show the non-linearity of the archived input-output relationship by the Fuzzy Interface System, when output is compared with a linear non-fuzzy system, It shows that the proportional system fails to achieve the precision required at lower steering movement and at higher steering movement. As a result it fails to produce the output for proper key press. It only approximates the sigmoid curve at moderate values of the inputs.

The idea for the paper was to give the robustness gesture of driving control system that copy the real life driving skill. As it provides natural experience of driving, if someone plays this game without any problem, that person will get some idea about real life driving skills.

Reference:

https://www.google.com/url?sa=t&source=web&rct=j&url=http://amitkonar.com/images/conference_pdf/2015-C-7.pdf&ved=2ahUKEwiE_f-EzefwAhUxyzgGHUeaAcoQFjAAegQIAxAC&usg=AOvVaw26LopZpFfyq28LRwvCdTDH