Bicycle Navigation Using HMD (Head Mounted Display)

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ABSTRACT
The project is concerned with tackling navigation problems faced by long distance cyclists. The system uses HMD (Heads Mounted Display) to track the path of the rider. The System is integrated into the rider's helmet and will also map the distance travelled by the rider and also keep track of the amount of calories burnt during the ride. The HUD will display will use Google maps weather conditions so that the rider can avoid bad weather conditions during his ride. This then allows the rider to track his workout routines in a more efficient manner.

KEY WORDS: HMD, Cellphone, Navigation, tracking, Bicycle.

1. INTRODUCTION

The HMD display is any transparent display that presents data without requiring users to look away from their usual viewpoints. The name originates from how a pilot is able to view data with his head in an upward position with his eyes directed forward, instead of being angled down looking at lower instruments. Although this system was initially developed for military aviation, HUDs are now used in commercial vehicles, automobiles and many other commercial applications. The HMD on the other hand integrates the entire system into a mountable head display.   The objective of this project is to develop a more user friendly system which will enable the use of this breakthrough in technology by a wider section of society with the advent of the Oil Crisis leading to a price steep price hike. People are now opting to use more environment friendly methods to travel, such as, Buses, Metros, Trains and other means of public transport. The Bicycle is now also being used for travel as it not only serves as an effective means of short distance transport but it also helps to keep one's body fit.

As the youth become more aware of the environmental effects of the burning of fossil fuels. Many are talking up alternate means of transport. The answer however is simple, Bi-cycles can serve as an immediate short term solution to this growing problem and this HMD system will further improve the riding experience of the rider.

2. METHODOLOGY

The system harbors an integrated HMD set up which will help riders navigate through streets and to set up their preferred routes.

Helmet Mounted Display: A Head-mounted Display (HMD) is basically a computer display that you wear on your head. The HMD is mounted on a helmet. The monitor has been designed in such a way so as to make sure that no matter which direction the user may look, the display will always be in front of the user's eyes. Most HMDs have displays that cater to each eye, which provide added depth to the images being displayed. The HMD used here harbors a LCD (Liquid Crystal Display).

Some of the kinds of HMD displays include:
- Electroluminescent Displays
- Electrophoretic Displays (EP Displays)
- Fiber-Optics Displays
- Field Emission Displays (FED)
- Vacuum Fluorescent Displays (VFD)
- Light Emitting Diode(LED)
- Plasma Display.

However, one disadvantage of these systems is in that they offer very low brightness and a limited resolution. HMDs almost always include a tracking device so that the point of view displayed in the monitors changes as the user moves his head. Some of the HMD systems are integrated with speakers so as to provide a visual and an audio output.

Figure.1. Head mount display

Navigation System: Like most technology, the Global Positioning System (GPS) was originally developed for military use and has only recently become available to civilians. The first GPS satellite was launched back in 1978. Since that time, they've a constellation of satellites have been sent up o space to orbit the earth. Over 50 satellites

have been launched, but approximately 30 amongst the 50 are active. The GPS satellites need to be replaced every 10 years or so.

Each GPS satellite can orbit the earth twice a day. As they travel, they send out a low-power radio signal to the earth below. The GPS navigation unit receives this signal and measures the time it takes for the signal to get from the satellite to the receiver. The satellites have been arranged in a way such that they are always ready for data transmission.

The navigation system is integrated into a cellphone or a GPS tracking system which is then connected to the HMD and in turn projects the output into the display system. This gives the user a more detailed idea of where he needs to move. The narrative GPS system can also project its audio output through the integrated speakers connected to the head gear. The distance travelled by the rider is then calculated and then this data can then be fed into an application which will then display the number of calories burnt during the ride. This then gives the rider an opportunity to keep track of his regime. The navigation system will also project traffic information into the screen so that the rider and avoid heavy traffic during his travel. The system will automatically pick out the most effective route to the destination. This will then help to reduce road accidents between automobiles and cycles.

Figure.2. Navigation System

Power Supply: The Head Mounted Display is consumes about 12V of power and is powered by a DC supply from a Battery source which can be mounted on a backpack carried by the rider or into a mount in the Bi-cycle itself. The Navigation system will also draw power from the same source. The HMD system on its own is a low power consumption device and can last up to 35 hours on 4 AA batteries.

Working: The System tracks the starting position of the rider via the GPS satellites. After the user has inputted the location of the destination, it quickly finds the quickest routes to reach the destination. This includes the traffic situation along with the weather conditions. This system then displays the information into the screen and the user can then accurately track his movements without necessarily taking his eyes off the road.

Advantages: The system is extremely user friendly and serves as a lifeline for the general public especially for those who are unfamiliar with a particular location. Since the system does not require the user to take his eyes off the road for a substantial amount of time, the likelihood for an accident also decrees. Users can also keep track of the amount of calories burnt during a session. This can also serve as an effective aid during workouts. The Visual-Voice navigation facilities can also re-define the riding experience all together thus making it a very promising piece of technology.

Disadvantages: The system is a little bulky and can initially cause the rider some discomfort while riding. The navigation system requires an open space so as to provide an accurate representation of the road. The display on the other had has a low resolution and brightness which can sometimes cause difficulty to the rider.

3. RESULTS

The System is integrated into the rider's helmet and will also map the distance travelled by the rider and also keep track of the amount of calories burnt during the ride. The HUD will display will use Google maps weather conditions so that the rider can avoid bad weather conditions during his ride. This then allows the rider to track his workout routines in a more efficient manner.

4. CONCLUSION

The system will help riders to experience a marriage between technology and the conventional riding methods. This will encourage motorist to use bicycles more frequently and going by the current oil crisis could serve as a very useful aid for cycling enthusiast and fitness enthusiasts all around the world.

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