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SMART AND SAFE RIDING JACKET USING IoT

Dr.J.Krishna[1], G.Shiva Poojitha[2], M.Swarna Latha[3], Z. Pravallika[4], Y.V.Sai Teja[5], L.Vishnu Vardhan[6]

[1](*Associate Professor, Computer Science and Engineering, Annamacharya Institute of Technology and Sciences-Rajampet, INDIA*)

[2,3,4,5,6](*UG Scholar, CSE, Annamacharya Institute of Technology and Sciences-Rajampet, INDIA*)

ABSTRACT

The Airbag system is first introduced in 4-wheeled vehicles, this paper gives information about the introduction of the airbag system can be used in the Riding Jackets(for bike riders). This paper shows the working, construction, installation and what will be problems can occurs are discussed. The concept of this airbag Jacket system is "To reduce the injuries to a rider when impacting with an opposing vehicle and/or opposing object in frontal collisions by absorbing rider kinetic energy.

With the help of some sensor like Gyroscope sensor, 6-axis motion tracking sensor and Accelerometers sensor with an indicator and sense of the collision and the Cartridge release the gas to open the air bags to avoid injuries from accidents.

Keywords*-Airbag, Cartridge, Injuries, Riding Jacket, Sensors.*

I. Introduction

Nowadays the increment in the death rate of India is 20% because of the accidents on the highways hence this invention can help us to reduce the death rate by 7% to 10% since this can be used in the pedestrian and safety department. In 4-wheeler vehicle the operations is based on the collision of two vehicles or collision with any object. This system is installed in the backside of the Jacket.

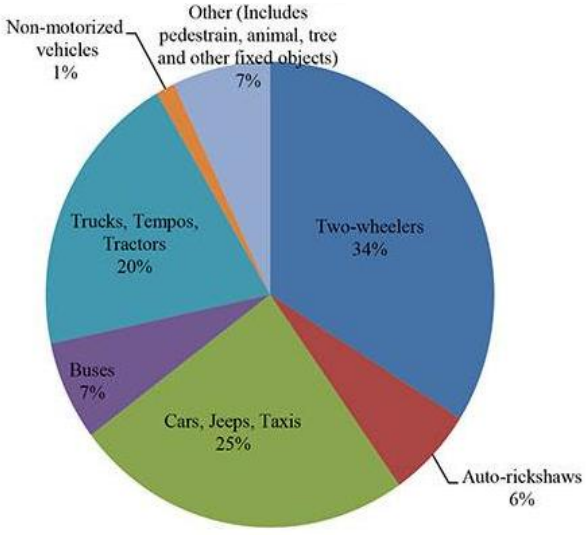

Fig 1:-graph shows the different vehicles in road accidents at 2017.

The figures speak for themselves. Over the last year, the number of Tow-wheeler accidents was increased. As roads have become increasingly busy, the number of traffic accidents has also increased dramatically. This new system which can help to severity of injuries caused by frontal collision is to be made available on the Airbag jacket .In the Airbag Jacket system there is installation of the airbag system in most effected places in the body(mainly head, shoulders, ribs, etc.,,). There is usage of control board along with sensors to operate thisAirbags. There are two cases when system runs by both the angle difference calculation and collision of the 2 bikes or by the any accident of bike with any object.

II. How does it work?

AIRBAG JACKET borrows their concept from the airbags used in cars.

The airbag itself is placed inside the jacket and connected with compressed air cylinder (cartridge).

The airbag jacket is activated when we wear and zipped the jacket. The motion sensors are start calculating the motion of the rider while riding bike. When an accident happens, the device embedded with IoT inside the jacket uses an algorithm and motion detectors to work out when a rider moves an abnormal movement that indicates an accident.

When the sensors detect abnormal movement, it sends notification to control board. The control board released spring drives the piston that punctures the cover of the cartridge and allows gas to disperse through the opening. We use a CO_2 (carbon dioxide) or Argon is punctured by a triggering device and then the non-toxic and non-flammable compressed gas expands and travels quickly into the airbags via tunnels. The airbags were placed most effected places through in our body. The airbags contains small leak punchers because, if the airbags is filled with full of gas it may get hard it will affected the rider. So, if the airbag contains punchers it will smooth, comfortable and unaffected to the rider.

When the airbags expanded, the second step is control board send the exact location of rider to related persons and near emergence cares. It will help if he gets unconscious stage. The battery life of jacket is more than 60 hours. Once this Airbag is used you can able to REUSE the sameairbag by filling CO_2 gas in the cartridge.

III. Design with required instruments

There are following instruments used for the AIRBAG JACKET system

1. Riding Jacket(made with hard fabric Nylon)
2. Air bag (Fabric Nylon)
3. Chemical cylinders for releasing the air or gas (12 grams of CO_2 Cartridges-2)
4. MPU-6050 Sensor
5. GPS sensor
6. Rechargeable Battery
7. Solenoid valve

3.1 About Riding Jacket

While clothing cannot prevent severe high-impact injuries, there is evidence that by using effective protective clothing, perhaps half of all motorcycle injuries might have been reduced or prevented.

Research based on crash research, accident studies and testing has set standards for successful motorcycle protective clothing features. It has also provided objective tests as a way of testing the safety value of such garments, but this information has not been used by manufacturers or transmitted through to customers.

Although clothing cannot avoid severe high-impact accidents, there is evidence that by using appropriate protective clothing, maybe half of all motorcycle injuries might have been minimized or avoided. Research based on crash investigation, accident research and engineering has set standards for appropriate protective clothing for motorcycles. It also carried out objective tests.

Fig 3.1: Riding jacket

Surveys found that the choice of clothing for riders does not reflect knowledge of the trends of risk of injury that researchers know about. Independent safety reviews in Europe have shown that many of the currently available garments will not provide the expected level of injury protection in a crash.

While the regulations for protective clothing for motorcycles are only in place in Europe, their introduction has implications for the industry around the world. This provided an opportunity to encourage the local Australian motorcycle industry to develop a motorcycle clothing product safety assurance program to remain competitive with European imports.The aim was to achieve a higher quality of protective clothing, consumer confidence and thus increased use by riders who can be confident that they are fit for the purpose.

Surveys found that the choice of clothing for riders does not reflect knowledge of the trends of risk of injury that researchers are well aware of. Independent market reviews in Europe have shown that much of the clothing available at the moment will not provide the expected level of injury safety in a crash.While the regulations for protective clothing for motorcycles are only in place in Europe, their introduction has implications for the industry around the world. This provided an opportunity to enable the local Australian motorcycle industry to develop a motorcycle clothing product safety assurance program to remain competitive with Europeanimports.The aim was to achieve a higher level of protective clothing, consumer confidence, and thus in creased use by riders who can be confident that they are fit for the purpose.

3.1.1 Use of protective clothing for the riders

A survey conducted in 2002 by 796 motorcyclists in New South Wales showed that while almost all riders wear a helmet and motorcycle jacket, they were less likely to wear protective clothing on their hands. Motorcycle

pants were usually worn by less than half (45 percent) of riders. Among their pillion passengers, the situation was significantly worse with just 36 percent motorcycle pants.

Motorcycle clothing feature the survey results led to a project examining the characteristics of effective safe motorcycle clothing. The goal was twofold:

1. Encouraging the use of protective clothing by providing the means for riders to make informed buying decisions.

2. To provide advice in terms of safety features to the motorcycle clothing industry, so that these can be integrated in various fashions or gear types.

Any discussion of motorcyclist clothing should first distinguish between the various purposes for which it can be worn.

Fig 3.1.1: Person skip from the bike

The clothes of motorcyclists may:

1. In the case of a crash, avoid or mitigate death.

2. Secure against the elements, wind, rain, cold and heat.

3. Get other motorists ' attention (conspicuous) .

4. Make a statement of the fashion you like.

The focus is on accident prevention, although for motorcyclists, comfort and conspicuity are also safety issues. Comfort from the elements in terms of protection is critical for reducing fatigue, irritation and dehydration. The challenge facing manufacturers is to provide protection against damage, as well as the weather, without limiting ease of movement or causing tension fatigue.

There is less well-established capacity for clothing to improve the visibility of a rider to other drivers. Nevertheless, it is a concern that every rider has to consider failing to see the motorcyclist as a factor in motorcycle crashes for up to half of the drivers (EEVC, 1993).

The fashion problem is not totally trivial. Motorcycle apparel can be very costly and one of our aims with this project is to help riders differentiate between fashion-only clothing features and those with real protective merit.Protective clothing usually includes gloves, boots, a long sleeved jacket and trousers, or one piece suit made of high abrasion and tear resistance leather or other fabric.

New materials, new methods of production and improved quality controls all have an effect on the end product.

Some pieces, some impact protectors to absorb or disperse force at different impact points will also be included in these days. Helms are not included in our debate because they are mandatory in Australia and use is widely accepted.

3.2 Materials used

Nylon 6, 6 yarns in deniers ranging from 420 to 840 are the primarily used raw material for the airbag fabric. 1880 D nylon-6.61, 6-9, 25 were used by the side impact airbags. The critical houses of these commonly used fabrics are indicated in Table 3. They are usually woven, with both being built840 X 840 D, 98 X 98/dm plain weave, 60 "wide or 420 X 420 D, 193 X 193/dm plain weave, 60" wide22-25.

Fig 3.2: Airbag

Generally Rapier with 400 m / min insertion fee was found to be most appropriate for weaving airbags. Because, with a precision of 1 CN per warp12-14, it can carry warp anxiety. Even water jet and 600 m / min insert air jet are used15. The airbag made was typically lined by neoprene, but recent varieties of silicon-coated and uncoated variants have been popular. With driver seats, painted airbags are generally preferred. The uncoated weight per unit size is higher than the coated bags4, i.e. 244-257 Vs 175 g / m2. Today, apart from Nylon 6, 6, the cutting-edge lookup on workable airbag substances includes high polyester tenacity, Nylon 4, 6, etc. Nylon 6, 6, however, has the best in all.

Two strong prerequisites 1-2 must maintain stability in the air bag fabric. To fold into relatively small volumes, it must be bendy enough. At the same time, it must be sufficiently robust to withstand high-speed deployment,

e.g. below that, having an impact on an explosive charge, and having an impact on passengers or other effects while inflated21-25To successfully perform this task, airbag material should have nice parameters

1. Small density of fabric.
2. Low weight of the particular fabric.
3. Strong tenacity and durability in warp and weft direction.
4. Strong tenacity to tear the furthers.
5. Elevated elongation.
6. Good age resistance.
7. Up to 190^0C heat resistance.
8. Good ultraviolet resistance.
9. The air permeability is low and very even.
10. Gas permeability is precisely regulated.
11. Reduced costs
12. Very good.
13. Reduced value or resistance burning.
14. Improved flexibility and height of the pack

3.3 Chemical cylinders for releasing the air or gas (12 grams of CO_2 Cartridges-2)

This cartridge cylinder is made with robust material. We are using co_2 chemical to make bigger the Airbag.

Fig 3.3: Cartridge

3.3.1 Chemical response behind opening of airbag

Actual opening of air bag is due to the chemical response occurred in between two chemical cylinders which are fitted at the behind the Jacket. When an external force or collision of two objects with bike show up then those two chemical cylinders mixes and the chemical response takes area inner the cylinder. At the outlet of the cylinder, the excessive pressure exhaust gas (air) is expanded from exit valve. The strain can be managed by using pressure valve in between air bag and chemical cylinder. This exhaust air or fuel is used to fill the air bag and hence an air bag will open.

The signals from quite a range of sensors are fed into the Airbag control unit, which, along with different variables, determines the impact attitude, frequency, or force of the crash. The combustion propellant produces

inert gas that quickly inflates the airbag in about 20 to 30 milliseconds.An airbag must inflate rapidly to be fully inflated by the time the forward-travelling occupant reaches its outer surface. Typically, the selection to install an airbag in a frontal crash is made within 15 to 30 milliseconds after the onset of the crash, and airbags are fully inflated within about 60-80 milliseconds after the first moment of vehicle contact. If an airbag is deployed too late or too slowly, it may also increase the danger of occupant injury from impact with the inflating airbag. Because there is usually a greater distance between the Rider and the target, the 12 grams of CO_2 release 2-4 kg of gas. Within 40 milliseconds of impact.

3.4 About Sensors

MPU-6050 module 3axis gyroscope +accelerometer

All MEMS accelerometer sensors typically calculate the weight displacement with a circuit interface location calculation. This measurement is then transformed via analog-to-digital converter (ADC) for digital processing into a digital electrical signal. Nevertheless, gyroscopes measure both the rotation of the resonating mass and its frame due to the acceleration of Carioles.

The Sensing Mechanism of the Accelerometer a common sensing technique used in accelerometers is power sensing in which acceleration is correlated with increasing a moving mass capacity. This sensing technique is known for its high precision, reliability, low dissipation of power and simple construction structure. It is not susceptible to noise and temperature variation. Bandwidth for a capacitive accelerometer is only a few hundred Hertz due to its physical geometry (spring) and the air trapped within the IC acting as a damper.

Fig 3.4: MPU-6050 sensor

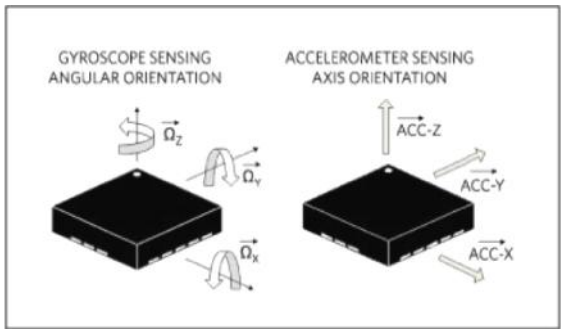

Fig 3.4.1: How the sensors calculate the directions.

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3.5About GPS sensor

As we know GPS stands for Global Positioning System the system includes satellites and installations for ground-based control. The GPS sensor consists of a surface mount module that uses a small rectangular antenna to process GPS satellite signals, often mounted on top of the GPS chip.

• GPS module is usually a small board with external components mounted on the GPS sensor.

• The GPS receiver is a system that contains data display and other data storage component in addition to the GPS module

Fig 3.5: GPS module

Breakout board depicts together with the GPS sensor provided by the Ad fruit industry. There are three parts of the GPS system. Segment of room, segment of power, segment of consumer. As of August 2018, the space section has about 31 satellites positioned in the orbit approximately 12,500 miles above Earth.Each of these satellitescircles orbits twice in 24 hours. Segment control includes stations for command, control and monitoring. User segment consists of receiving devices (e.g. public and private).

3.6Battery

Configuration of impact of motorbike to car. We can get safety from the above noted bodily harms as described as, the air bag system opens from the extraordinary places from the Jacket; consequently we can avoid hand/leg cracks or fractures. The unique pieces of airbags are included the rider body and head, hence head harm is avoided. As the fabric used in the air bag building is light weight robust leather the possibilities of bike skidding or slipping is diminished and exterior injuries like scratches are avoided. The probabilities of the rider being thrown sporting Jacket are prevented as the leather-based belts are provided on both aspects of the bike to invulnerable the legs of the rider. The material used for constructing these belts is comparable to those used for establishing the seat belts in the cars.

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Fig 3.6: Lithium-ion battery

A Li-ion battery (abbreviated as LIB) or lithium-ion battery is a type of rechargeable battery. Lithium-ion batteries are widely used in portable electronics and electric vehicles, and are being designed for military and aerospace applications in recognition.Throughout the 1970s–1980s, technology was primarily created by John Good enough, Stanley Whittingham, RachidYazami and Akira Yoshino, and then sold through a team headed by Sony and Asahi Kasei with the aid of Yoshio Nishi in 1991.

At some point of discharge, lithium ions in the batteries migrate from the weak electrode via an electrolyte to the high-quality electrode, and back while charging. Li-ion batteries use an intercalated lithium compound as the material on the electrode of high quality and usually graphite on the electrode of poor. The batteries have high density of energy, no effect of reminiscence (other than LFP cells) and low self-discharge. On the other side, they can be a safety hazard since they contain a flammable electrolyte and can lead to explosions and fires if damaged or wrongly charged. Samsung was pressured after lithium-ion fires to recall Galaxy Note 7 handsets there were quite a few incidents involving Boeing 787s batteries.

The characteristics of chemistry, efficiency, cost and safety differ across LIB forms. Handheld electronics mainly use lithium polymer batteries (with a polymer gel as an electrolyte) with lithium cobalt oxide (LiCoO2) as a cathode material, which gives excessive power density but poses security risks, particularly if damaged.Lithium iron phosphate (LiFePO4), lithium ion manganese oxide battery (LiMn2O4, Li2MnO3 or LMO) and lithium nickel manganese cobalt oxide (LiNiMnCoO2 or NMC) offer lower resistance density but longer lives and much less fire or explosion risk. These batteries are commonly used for electrical equipment, medical equipment, and other functions. In particular, NMC is a major contender for automobile applications.

3.7 Solenoid Valve

A Solenoid valve is an electromechanical device used for controlling liquid or gas flow. Solenoid valves make automation of fluid and gas control possible. Modern solenoid valves offer fast operation, high reliability, long service life, and compact design.

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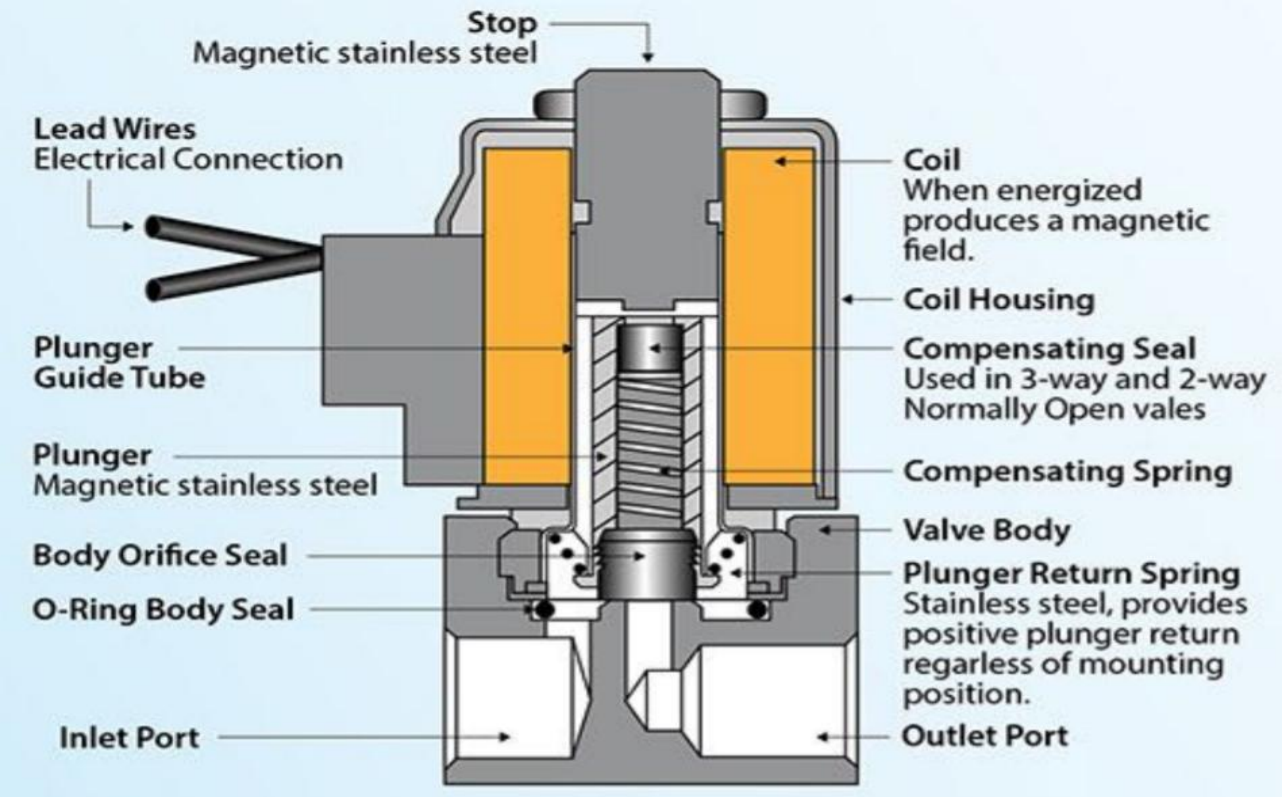
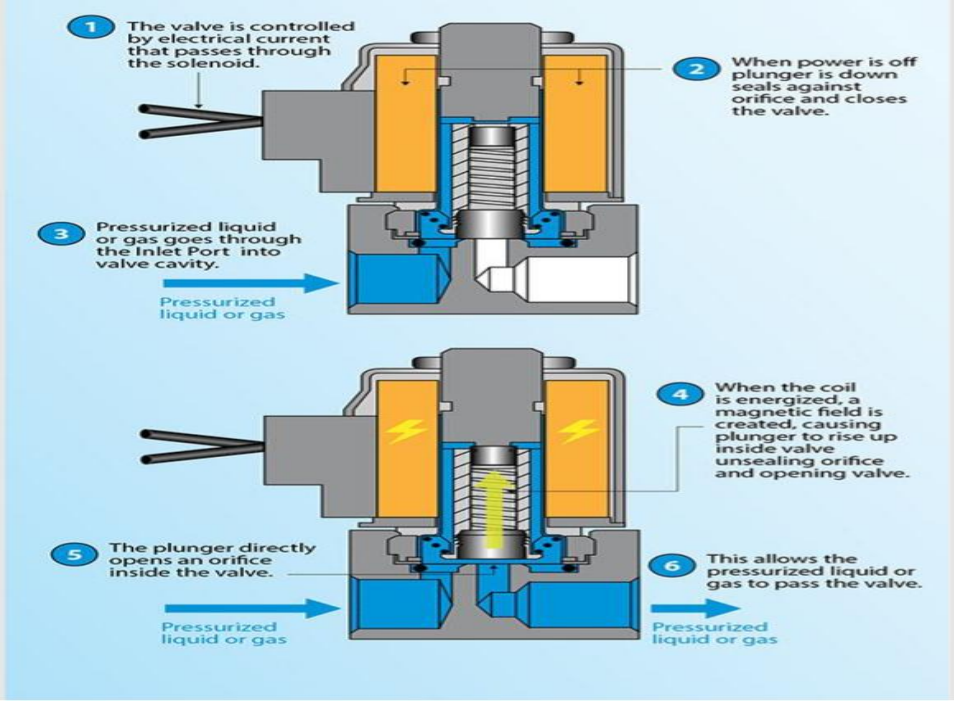
3.7.1Different parts of a 2-way normally closed solenoid valve



3.7.2 How a 2-way normally closed solenoid valve work



IV. How air bag system protects the human body parts

The provision of air bags on Jacket is extra complex than installation in car, because the jacket is a wearable dress so, it is extra hard to predict but we going to discuss following points on accident. These characteristics leads to act with very short response time and speedy inflation but only if the rider is contain in the accident the higher limit of these gadget is that they work exact only under the unique stipulations Especially the rider need to remain on the motorbike throughout the accident and they have an effect on dynamics have to lead him to hit exactly the phase of his body covered via airbags.

OUR PRODUCT	PREVIOUS PRODUCT
It covers around neck, plungs down the chest and head	It covers only neck and chest.
We will use it for a long period of time without any damage.	In long runs, it will be damaged easily.
Its cost is less than 20,000.	Its cost from 1lakh to 3lakhs.
It contains low humidity.	It contains lot of humidity.
The airbags are placed outside the jacket, when it expanded it will be comfortable and it won't be tight.	The airbags are placed inside the jacket, when it expanded it will be too tight.
It is comfortable to wear because of the lining present in it.	Presence of spots and Velcro anywhere that makes jacket uncomfortable to wear
If you are going to ride in heat, especially in the heavy traffic in the cities as this jacket is designed with fabric cloth which contains small holes it light –weighted.	If you are going to ride in heat, especially in the heavy traffic in the cities, you might find it bit heavy.
After airbags usage replace cost is less than 3,000.	After airbag usage the replace cost is 18,000.

V. Conclusion and Future Work

By offering the total security to the motorcycle rider by way of implanting the airbags in driving Jackets point out in this paper we will reduce the fatality fee by way of 20% to 30%.by the use of this technological know-how there is now not only reduce the dying rate but additionally we offers the complete safety to the rider.

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