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A Study on Auto Rising Pedestrian Crossing and Kinetic Roads

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Abstract: Pedestrian crossing is a very important component of transportation infrastructures that serves to secure pedestrians and their life, possessions and keep traffic flow in a designated manner. It is a distinguished feature within the street scene that the detection of crossing of pedestrian contributed to the invention of 3D road marking reconstruction and decreasing the adverse impact of outliers in 3D street scene reconstruction. Since the crossing of pedestrian is subject to wear and tear from serious and high traffic flow, it's of nice imperative to observe its standing and its present level. So, crossing of pedestrian detection and analysis system with high recall rate, preciseness and strength are going to be achieved adopting the automated raising crossing. This technique works for crossing detection below completely different things and light-weight conditions. Hence acknowledge defiled and impaired crossings mechanically within the meantime that facilitates observation and maintenance of traffic facilities, to cut back potential traffic safety issues and secure lives and property. In the current project, it is co related to the pedestrian safety and the way will we tend to scale back the pedestrian accidents. So, to extend the pedestrian safety and to cut back the concern of crossing the pavements throughout the traffic flow, we tend to came up with a concept of automatic raised pedestrian crossover that works with the facility generated from the moving vehicle by kinetic speed breakers & star panels for operating.

Keywords: Pedestrian, crossing, safety, traffic, investigation, kinetic speed breakers.

I. INTRODUCTION

A crosswalk (primarily British English) or path (American English) or pelecaniform seabird crosswalks (Greek language) might be an area elect for pedestrians to cross a road, street or avenue According to the IRC 103-2012 [1] clause a 2.5, Pedestrian is used to figure out the people who walk, sit, fill publically areas or use the standard aid like walking stick, crutches or wheel chairs, be they youngsters teenagers, adults, senior persons, persons with disabilities, workers, residents, shoppers or people-watchers.

The expression crossing is used in some international treaties on road traffic and road signs, just like the Austrian capital Convention on Road Traffic and additionally the Austrian capital Convention on Road Signs and Signals. These are usually place in where big numbers of pedestrians try and cross (such as in wanting areas) or where vulnerable road users (such as college children) typically cross. People walk for many reasons: to trip a neighbour's house, to run errands, for school, or to urge to a business meeting. People put together walk for recreation and health blessings or for the enjoyment of being outside. Some pedestrians ought to walk to transit or completely different destinations if they have to travel severally. We tend to tend to ought to provides a secure, secure, and user-friendly system for all people who walk.

Signalised pedestrian crossings are accustomed clearly separate where each variety of traffic (pedestrians or road vehicles) can use the crossing. Unsignalized crossings typically assist pedestrians, and regularly prioritise pedestrians, betting on the neck of the woods

II. PEDESTRIAN PROBLEMS

Pedestrian accidents occur during a various way; the foremost common sort includes crosswalk or coming into in to the road at or in between the intersections.

Darting: it's accustomed represent the unexpected look of a pedestrian from behind a vehicle or alternative sight obstruction.

Dashing: It refers to the running pedestrians.

Special issues faced are

1. **Age**: Children who are under the age of 15 years from the largest group of pedestrian victims and experience the highest injury rate per population in their age group, the elderly has the highest fatality rate because of the lower probability of their recovery from the experienced injuries.
2. **Intoxication and Drug effects**: Alcohol and drugs affects the behavior of Pedestrians on roads to the extent that they may be a primary cause of accident

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3. **Dusk and Darkness**: Special pedestrian safety problems arise during the hours of dusk and darkness, when it is most difficult for motorists to see pedestrians.
4. **Fear**: Many people have the fear of crossing the road due to the noises or fast approaching vehicles.
5. **Lack of awareness**: People are less aware about the traffic rules & regulations, signs etc.

III. CROSSWALK LATEST INSTALLATION CRITERIA

Some Countries have specific criteria to provide pedestrian facilities; for example, they provide warrants, depending on local conditions, usually prioritized as follows:

1. **Do nothing: -** In maximum places, the pedestrian does not required specific facilities, as in low car flow streets, the pedestrians can cross (without priority) at any location.
2. **Providing central islands in the road: -** It provides or leads the pedestrian to a safe place to wait at the middle of the road and proceed as conditions permit (Figure: 1).

Figure 1: Providing central islands in the road

3. **Central reservation: -** A continuous (Usually raised) central reservation creates safe pedestrian crossing in that particular area, and reduce vehicle speed and head-on crash (Figure: 2).

Figure 2: Central reservation

4. **Zebra crossing:-** It provides a crossing in an area where low pedestrians flow is recorded, if the pedestrian flow is high in area such as outside a school, train or bus terminal, then the vehicle traffic will be severally affected by a significant number of pedestrians using the crossing, making necessary to provide traffic signals.
5. **Traffic signals (Pelican in the U.K.): -** these signals are used to control vehicle-pedestrian conflicts/accidents, not in intersections, and provides with pedestrian's buttons for the purpose of crossing. In this way, the vehicle signal turns red only if a pedestrian is trying to cross.
6. **A staggered traffic signal: -** If the width of road is large, (two or additional traffic lines per traffic direction) and a central island reservation exists at the spot or is provided, traffic signals is put in during a not aligned combine. This style permits to produce a staggered inexperienced time for pedestrians to cross the section (one aspect is inexperienced whereas the opposite is red), The pedestrian have to wait within the central reservation for some lapse of time for the second crossing, up the chance to coordinate traffic between the intersection, with a discount of stops, fuel consumption, and reduced automotive emissions.
7. **Pedestrian signal in the intersection: -** This facility is added in an intersection with a traffic signal, giving a clear cut instruction to a pedestrian when it is possible to cross. In some countries, it is provision is obligatory in all traffic signals.

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8. **Pedestrian overpass or underpass: -** This facility reduces or ends the conflict between the vehicles and pedestrians, but they need to be supported by some form of physical restriction preventing the pedestrians from crossing at level, as they are perceived the additional effort to climb and to overpass or underpass.

IV.DESIGN STANDARDS FOR THE CROSSWALK

According to the IRC: 103-2012(Clause6.7.3.1).

1. The walking speed of the pedestrian is nearly 1.2 m/sec.
2. The width of the crosswalk or zebra crossing should be 2-4m.
3. The red phase of the traffic signal or minimum stopping of the vehicle is 12 seconds for the 7.5m to allow the disable to complete their crossing.
4. There should be a stop line provided ahead in the section, to stop the vehicles which must be 600mm thick as per the guidelines IRC:35-1970.
5. The sign post of indicating the cross walk must be placed at a distance of half of the width of the crosswalk.

V.VARIOUS CROSSWALK FORMS.

Footbridges and tunnels: Footbridges or pedestrian tunnels could also be employed in role of crosswalks at terribly busy intersections in addition to the locations wherever limited-access roads and controlled-access highways should be crossed. They will even be helpful in locations wherever the sidewalk or pedestrian path naturally ascends or descends to a unique level than the intersection itself, and therefore the natural "desire line" results in a Passover bridge or tunnel, severally**.**

1) **Pedestrian scramble:** Some intersections display red lights in all directions for a period of time. Known as a pedestrian scramble, this type of vehicle all-way stop allows pedestrians to cross safely in any direction, including diagonally.
2) **Crosswalk shortening:** Pedestrian refuges or tiny islands within the middle of a street could also be accessorial once a street is extremely wide, as these crossings are too long for a few people to cross in one cycle. Another comparatively widespread variation is that the curb/kerb extension (also referred to as a bulb-out), that narrows the dimension of the road and is employed together with path markings. They will even be wont to impede cars, probably making a safer crossing for pedestrians.
3) **Crosswalk striping:** Pedestrian cross marking machines area unit special instrumentality professionally won't to paint zebra lines on the intersections or alternative busy road sections. Due to the characteristics of zebra crossings, parallel stripes that area unit wide however shortly, the marking machine is usually a tiny low hand-guided road marking machine, which may simply be created to vary direction. The marking shoe of a pedestrian cross marking machine, that determines marking lines' dimension, is far wider than on alternative marking machines. A smaller marking shoe with wheels could also be wont to perform the road marking.
4) **Crosswalks as artwork:** Some crosswalks embody distinctive styles, several of that take the shape of design. These works of art could serve many various functions, like attracting business enterprise or catching drivers' attention. The U.S. Federal main road Administration prohibits path art thanks to issues regarding safety and visibility, but U.S. cities have chosen to put in their own styles. Seattle had forty crosswalks with distinctive styles, as well as the rainbow flag in Capitol Hill and therefore the Pan-African flag within the Central District

VI. SPEED BREAKERS FOR PEDESTRIAN SAFETY.

Speed breakers square measure the common name for a family of traffic calming devices that use vertical deflection to slow motor-vehicle traffic so as to enhance safety conditions. Variations embrace the speed hump, speed cushion, and speed table.

1) A speed bump: A preventative may be a bump during a road with heights usually travels between 76-102 millimetres (3-4 inches). The crosswise distance of a preventative is usually but or capable zero.30 m (1 ft.); different with the broader speed humps, which usually have a traverse distance of three.0 to 4.3 m (10 to fourteen ft.).

2) A speed hump: A speed hump may be a rounded traffic calming device accustomed scale back the velocity of the vehicle speed and volume on residential streets. Humps are measured and placed across the road to slow traffic and are measure typically put in during a series of many humps to stop cars from rushing before and when the hump. Common speed humps square measure within the shapes of parabolic, circular, and curved.

3) Speed cushions: Speed cushions square measure a kind of speed hump installation designed to alleviate the negative impacts that vertical deflections wear emergency vehicle response times. Speed cushions installations square measure usually created of many tiny speed humps put in across the breadth of the road with areas between them. They

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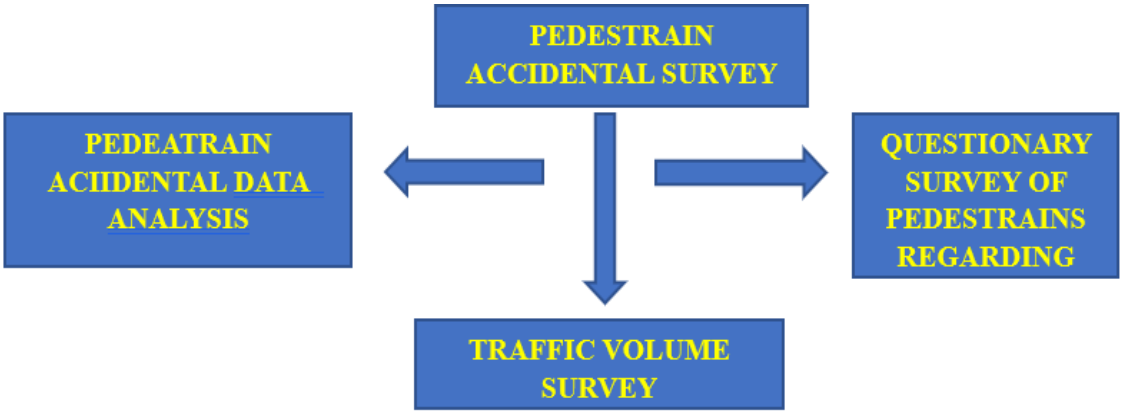
force traditional cars to prevent as they ride with one or each wheels over the humps. Meanwhile, they permit hearth engines (and alternative massive vehicles) with wider axles to straddle the cushions while not deceleration down.

VII. METHODOLOGY

Within the current study is said to the pedestrian safety and the way will we tend to scale back the pedestrian accidents. So, to extend the pedestrian safety and to cut back the concern of crossing the pavements throughout the traffic flow, we tend to came up with a concept of automatic raised pedestrian path. Wherever to implement these, we want to try to the survey on the pedestrian accidents.



PEDESTRIAN ACCIDENTAL DATA COLLECTION PROCESSES

ACCIDENTAL DATA ANALYSIS

The accidental knowledge was collected from the traffic department of Vijayawada from 2014 to 2019 that were segregated consistent with the accident of auto or person concerned and therefore the person injured. From that knowledge we've got separated the pedestrian accident knowledge yearly and noted down unsound spots or a lot of pedestrian accidental spots wherever the pedestrian accidents are measure predominant. We tend to additionally found the yearly increase within the pedestrian accidents and therefore the style of vehicles concerned.

QUESTIONER SURVEY

The Questioner survey conducted to grasp the thinking and therefore the behaviour of the motive force & pedestrian throughout the crossing the roads. This survey helps North American country to seek out the varied opinions of the individuals, any enhancements needed within the present facilities, would like of the individuals, their necessities, their concern & issue, comfort, safety throughout crossing.

TRAFFIC SURVEY

From the accident knowledge analysis, we've got found the BRTS road; add the locations wherever you have got done the survey …. Were a lot of accident zone areas for the pedestrians? The traffic volume survey is conducted at those places to seek out the traffic volume in terms of carriage Unit (PCU). The traffic volume obtained can facilitate North American country to grasp the bulk of the vehicles moving and therefore the density of the traffic and therefore the major zones of intersections. Nearby landmarks or hotspots wherever the foot traffic is high and why the explanations are notable.

WORKING OF THE AUTO RAISED PEDESTRIAN

1. The sensors are placed on the curb(where the folks wait to cross the road) they record the quantity of footsteps once it counts the utmost up to ten folks the sensors can flip mechanically the red signal for the vehicles to prevent & the automobile raise can begin, also the pedestrians will cross it.
2. We have a tendency to might implement a pole with a button the folks will press it once the pedestrian needs to cross then mechanically the red signal for the vehicles to prevent & the automobile raise can begin and also the pedestrians will cross it.

In the above approaches we might wish to adopt the second choice at initial stage underneath the direction of the traffic police so it can't be used. Later the primary choice will be enforced once the general public area unit alert to the usage.

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POWER GENERATION

For the working of the raised pedestrian crossing power is necessary. The power necessary for the working of raised pedestrian crossing can be generated on roads its self-i.e., the methods are as follows:

1. From the moving vehicles by placing the smart speed breakers which can generate the power by the pressure applied by the vehicle types.
2. By placing the solar panels on the road side for the signal post which are placed in the roads nearby.

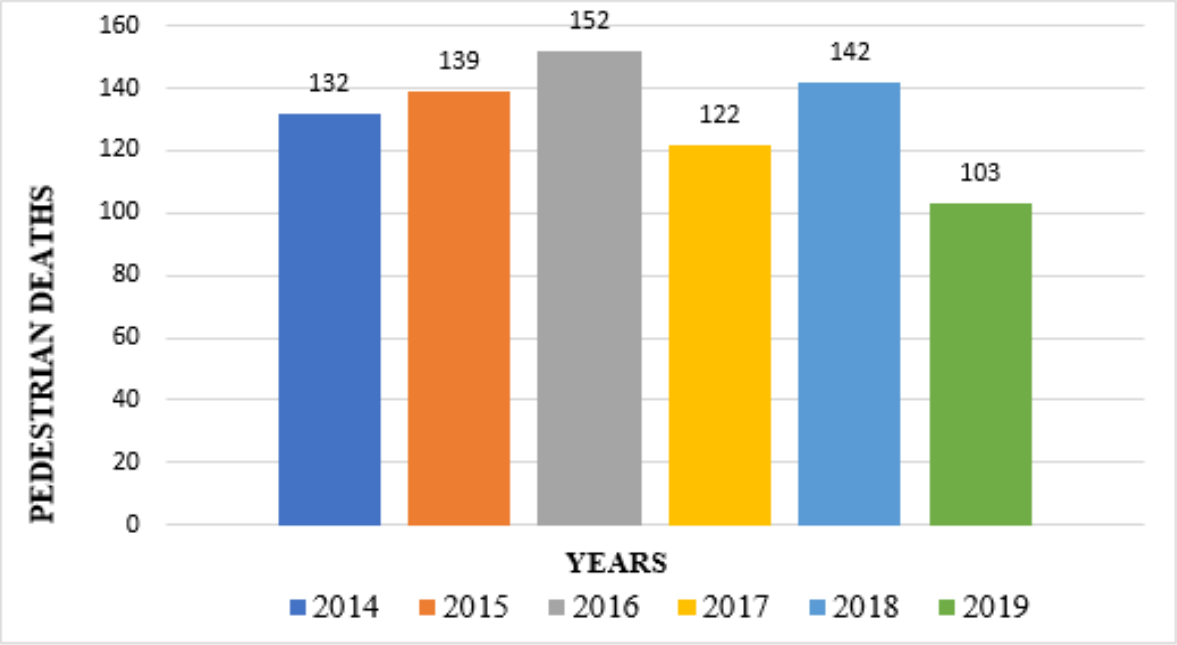
By placing the small wind fans which rotate due to the fast air developed by the movement vehicles

VIII. PEDESTRAIN ACIDENTAL DATA

Pedestrian accidental knowledge collected from Traffic department of Vijayawada, Five years records are collected and analysis the info. There are quite a hundreds of pedestrian accidents area occurred in per annum in Vijayawada. The pedestrian knowledge was sequestered from the accident knowledge supported death & blistered (Table:1).

Table 1 Yearly Pedestrian Death

YEAR	PEDESTRIAN DETHS	TOTAL DEATH	PEDESTRIAN INJURED	TOTAL INJURED
2014	132	342	447	1581
2015	139	381	469	1565
2016	152	382	405	1597
2017	122	372	372	1498
2018	142	364	365	1472
2019	103	354	345	1391



Graph 1: Yearly pedestrian death comparison

IX.TRAFFIC VOLUME SURVEY AT THE HIGH ACCIDENT-PRONE AREAS

PASSENGER CAR UNIT (PCU)

All the traffic knowledge collected should be regenerate into one unit of term referred to as PCU. The coach Unit (PCU), all the categories of vehicles will be expressed in PUC, every category of car has its own PCU issue worth counselled by

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the Indian Road Congress (IRC) shown in Table-2. As a result of in Asian nation we've got mixed traffic flow (i.e., there are not any separate lanes for every category or kind of vehicle) thus there's a necessity to convert all the traffic volume into one unit for the planning, growth of project etc...

Table 2: Type of vehicle to PCU calculation.

Sl. No	Type of Vehicle	PCU
1	Motor Cycle or Scooter (2-Wheeled)	0.5
2	Passenger Car, Pick-up van, Auto rickshaw	1.0
3	Agricultural Tractor, Light Commercial Vehicle	1.5
4	Truck or Bus	3.0
5	Truck-trailer, Agricultural Tractor-trailer	4.5
6	Bicycle	0.5
7	Cycle Rickshaw (Pedal)	2.0
8	Hand Cart	3.0
9	Horse-drawn Vehicle	4.0
10	Bullock Cart	8.0

4) DATA COLLECTION AND ANALYSIS

The traffic volume survey collected represents the density of the traffic flow in those particular areas. From the table:3 & Figure:25 the maximum PCU recorded is 343.2

PCU during 9:00-9:15

LOCATION OF THE SURVEY: SRR COLLAGE to BSNL Office
DATE: 29-02-2020-MORNING

Table 2: Traffic Volume at SRR college to BSNL office during 29-02-2020 morning

TIME	2W	3W	4W	LCV	HCV	PEDESTRAIN	TOTAL
9:00-9:15	356	124	75	14	15	---	343.2
9:15-9:30	322	100	61	6	12	---	279.4
9:30-9:45	257	116	48	8	6	68	239.6
9:45-10:00	263	105	44	12	9	---	247.9
10:00-10:15	252	114	89	9	8	---	284.2
10:15-10:30	178	117	65	10	7	---	232.1
10:30-10:45	266	164	80	10	6	---	303.6
10:45-11:00	186	130	90	19	10	157	293.2
TOAL	2080	970	552	88	73	225	
PCU VALUES	0.4	0.5	1	2.2	2.2	---	

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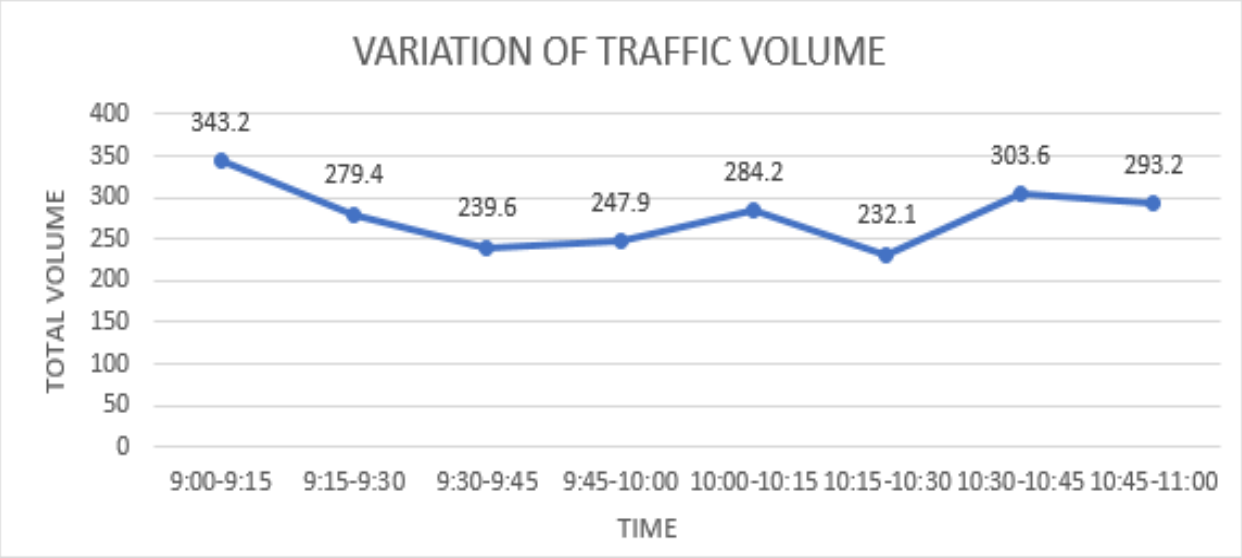

Graph 2: Variation of traffic volume or flow (SRR-BSNL 29-2-2020 MORNING)

X.WORKING MODEL

AURDINO UNO: The Arduino Uno is an open-source microcontroller board which is based on the mechanism of the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. Which can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

SERVO MOTOR: A servomotor could be a mechanism, positioner, actuator or linear actuator that enables for precise management of angular or linear position, speed and acceleration. It comprises of an appropriate motor coupled to a sensing element for position feedback. It conjointly needs a comparatively subtle controller, usually an obsessive module designed specifically to be used with servomotors.

ULTRASONIC SENSOR: Ultrasonic transducers and ultrasonic sensors are area unit devices that generate or sense ultrasound energy. They'll be divided into 3 broad categories: transmitters, receivers and transceivers. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers will each transmit and receive ultrasound.

XI.KINETIC ROADS

The power which is required for the auto- raising pedestrian crossing is itself generated on the road itself through various methods. They are smart speed breakers, by using solar power panels or wind mills on the sign or signal poles of the crosswalk to generate electricity.

SMART SPEED BREAKERS

By manufacturing the electricity from the vehicles after they go on the speed breakers. As vehicles ought to apply pressure on the speed breaker as a result of they have to cross it that is at another level of the road. There are varied mechanisms (Figure:31,32 &33) of power generation through speed breakers specifically.

1. Rolling mechanism
2. Spring coil mechanism
3. Crank & Shaft mechanism

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Figure 31: Rolling mechanism in speed breakers

XII. PEDESTRAIN SIGNALS

Many people are lack within the knowledge regarding the traffic rules and laws of department. So, they are instructed to need to watch out regarding them. To increase the security the signs & signals installation at several positions area unit necessary. There are several ways to point the cross walk and its location etc...
The crosswalk signal installation is also done uniquely or will be combined with the traffic signals (Figure: 25). The crosswalk signal may be conjointly be with or while not the timer also however the timer provides the folks to form a judgement. There also are different ways in which to point in words like walk, wait. Don't walk etc… however several cants ready to see or scan thus red and inexperienced signal with indicating human at the side of timer are best option.

XIII. CONCLUSION

- This project was developed to increase the pedestrian safety and to reduce the fear or scared feeling among them while crossing the roads with heavy passing of vehicles. The auto raise pedestrian crosswalk will give them the confidence as well as security to cross the road majorly for
- The handicap people who seeks other's help to cross the roads
- The old people who walks slowly in roads and in intersections
- Children who are unaware of the traffic & its rules and regulations
- The people who are feared to cross the road alone or in heavy traffic or in night times
- The project survey conducted has given the thought that every human being like to cross the road with minimum efforts. The major amount of pedestrian is not willing to cross overpass or underpass as they need to apply more effort in climbing up & climbing down the steps.
- The auto raises pedestrian crosswalk will help the pedestrian to cross it securely and it also helps to stop or reduce speed of the vehicles when the pedestrian is crossing the road or street.
- First this application must be done under the supervision of staff; later the automatic process can be implemented on the roads.
- But the implementation & it's working must go to the public. How it works, what the pedestrian must do. This awareness must be spread through the social media & by giving the demo at various public places such as schools, colleges, offices.

XIV.FUTURE SCOPE

The traffic is rapidly increasing so, there is a need to improve and be prepared for the future challenges regarding the growth of traffic more effectively various approaches can be made through.

1. The shortage of light on roads and streets can be reduced to some extent by using various approaches and methodologies.
2. Wastage of energy from the vehicles passing on roads can be minimized and utilized efficiently.
3. Implementation of smart speed breakers can be efficient in terms of heavy vehicles, thus increasing input weight and ultimately increasing output of generator.
4. More suitable and compact mechanisms to enhance efficiency of roads and vehicles can be implemented, so that they may be used for light vehicle also.

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