Priority Based Smart Traffic Control System For Emergency Vehicle

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Abstract: Major Problem That Is Being Faced By Everyone Day To Day Is Traffic Congestion. Traffic Congestion May Occur Due To Many Reasons Few Being Poor Infrastructure, Uneven Distribution Of Development. In Developing Countries, The Traffic Lights Use Fixed Time Concepts Where The Duration Of Lights Are Independent Of The Traffic Density. This Yields Poor Traffic Control And Severe Traffic Congestions. Nowadays The Traffic Control System Is Quite Inefficient. There Are Many Situations Where The Traffic In Different Lanes Varies Due To The Timer-Based Signalling The Less Dense Lane Also Need To Wait For The Set Time. The Main Aim Of This Work Is To First Detect The Presence Of Any Emergency Vehicle Along With Estimating The Number Of Vehicles In Each Lane. Based On A Smart Traffic Control System, Priority Is Given To The Lane With Emergency And Restoring The Mode To Normal And Then Prioritizing The Lane With Higher Density.

1. INTRODUCTION

In The Roads Of Urban Areas, The Major Problems Is To Handle Traffic Congestion Where The Waiting Of Vehicles In Along Queue. At The Traffic Junctions With Four Road Crossing And More, The Infrastructure Existing Is Not Enough To Provide The Comfortable Situations To The Transportation Users. The Traffic Signals With Predefined Timer In A Phased Manner Are Being The Method Of Preference As The Simple Technique. The Timer-Based Traffic System Is Suitable Only For Light Traffic Which Uses A Predefined Time Setting For Its Processing. For Heavy Traffic System, An Adaptive System Is Required Which Could Manage The Traffic Density.

The Main Drawback Of Generalized Traffic Control System Is High Priority Situations And Emergency Conditions Are Difficult To Detect. This Urges The Need Of Smart Traffic Control System To Make It Suitable To Handle All Conditions And To Take Decisions Automatically.

The Other Way Like A Sensor Based System Can Be Implemented To Detect The Vehicle And Accordingly The Decision Of Signal Sequencing Can Be Done In Cycle. Further To Improve The System, Image Processing Technology Can Be Used For The Decision Making In The Control Of Traffic Signal. The Images In Sequence Obtained Through The Cameras Installed In The Traffic System Replace The Sensor Based Traffic Control System. The Reference Image For The Working Of The System Being The Image Of An Empty Road, The Matching Of The Currently Taken Image Is Done To Know The Traffic Density And Intern Enable The Traffic Signal.

Ii Objective

The Main Objective Of This Work Is To Manage Traffic With Less Effort, Less Cost And Make Them More Effective And Quicker. For This, A Smart Traffic Control System Is Developed In Which The Image Processing Acts As A Key Technology. Emergency Vehicle Is Detected Using Image Processing Technique And Highest Priority Is Assigned To That Particular Road In A Traffic Intersection. The Results Are Displayed Which Provides The Road With Emergency Vehicle Detected As A Prompt In Matlab After Running The Code.

After Detecting Emergency Vehicle In A Particular Road, The Signal Is Turned Green For About Fixed Time Duration. Then The Road With Highest Traffic Density Is Detected And Accordingly The Signal In That Particular Road Is Turned Green. Normal Sequence Of Traffic Signal Variation Is Altered By Changing The Traffic Signal Of The Particular Road With Either Emergency Vehicle Or Road With Highest Density Of Traffic
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Iii Block Diagram

Modules

Hardware Module

The Hardware Module Of The Proposed Model Has

- A General-Purpose Pc As A Central Processing Unit For Various Stages Of Image Processing Has Been Used.
- Light Emitting Diode As A Prototype Of The Real-World Traffic Signal Depicting Signal At Four Roads.
- A Driver Unit Is Used To Control Voltage Flow To Led's.
- Pic16fxx 40 Pin Microcontroller To Control The Led Lights.
- Rg1602a Lcd Display.
- Usb-Ttl Interfacing Chord For Data Transfer To Pic Microcontroller.
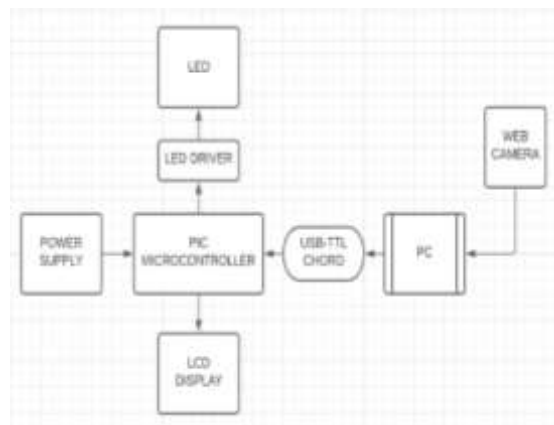- 12v Adapter For Providing Power Supply To Pic Microcontroller.

Figure 1: Block Diagram Of The Proposed Methodology

Iv Flowchart

The Output Of This Process Is The Analyzed Traffic Condition That Is Heavy, Medium, Low, And Emergency.

The Various Steps Involved Are As Follows:

- The Images Of The Traffic With And Without Emergency Vehicles With Different Traffic Density Is Fed To The Personal Computer
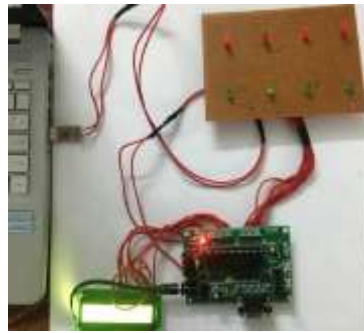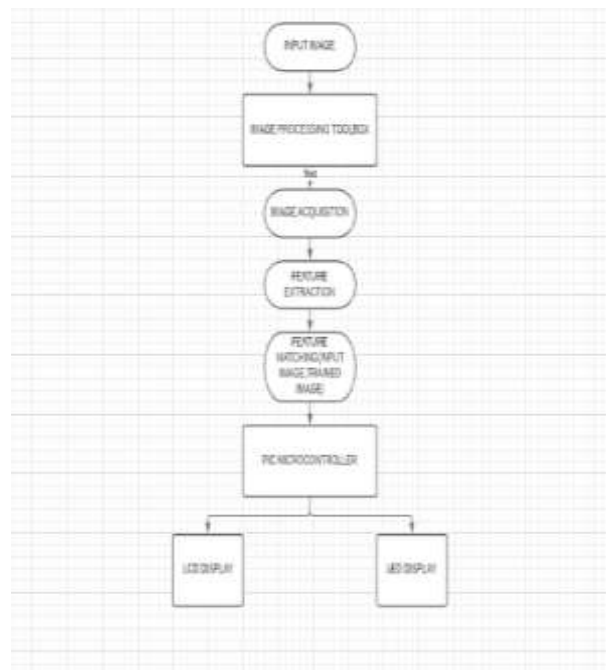
Figure 2: Proposed Module

Figure 3: Flowchart Of The Proposed Methodology

- These Images Are Processed Using The Image Processing Toolbox Of The Matlab.
- The Various Steps Involved In This Process Are Image Acquisition, Feature Detection, Feature Matching
- The Feature Matching Is Done Between The Input Images And Already Loaded Test Images
- A Specific Value Is Obtained Prior During The Testing Process
- During The Feature Match These Values Are Noted And The Traffic Condition Is Thus Characterized As Heavy, Medium, Low, Emergency
- This Process Is Repeated For All The Four Roads
- Based On The Output, The Data Is Then Fed To Pic Microcontroller For Controlling The Traffic Signal
- The Corresponding Action Is Displayed Through Lcd Display

2. RESULTS

On Detection Of Emergency Vehicle, The Following Events Occur.

- The Normal Sequential Switching Of The Traffic Signal Is Interrupted Immediately On Detection Of Emergency Vehicle.
- The Traffic For The North Road Detected With Emergency Vehicle Is Switched On For A Time Greater Than The Signal In Normal Operation Mode.
- Once The Emergency Vehicle Crosses The Signal The Normal Sequential Operation Is Restored.
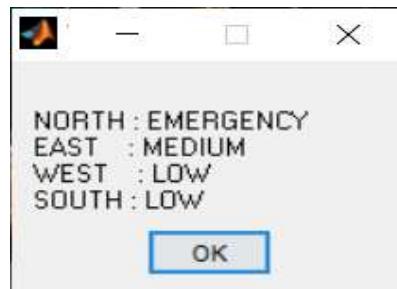

Figure 4: Emergency Vehicle Detection In North

On Detection Of High Density Of Traffic, The Following Events Occur.
- The Normal Operation Is Not Interrupted And The Signal Switches Sequentially.
- Once The Signal For The Detected Road Is Reached The Signal Remains On For A Period Greater Than The Normal Time.
- The Normal Operation Is Restored After This.

On Detection Of Emergency Vehicle Along With Heavy Road Traffic Density, Following Sequence Of Events Occurs

- Normal Operation Of Signal Is Interrupted.
- The Signal Remains On In North Road Where Emergency Vehicle Is Detected.
- The Sequence Continues
- The Signal Remains On For West Road Due To Heavy Traffic Density.
- The Normal Operation Is Restored.

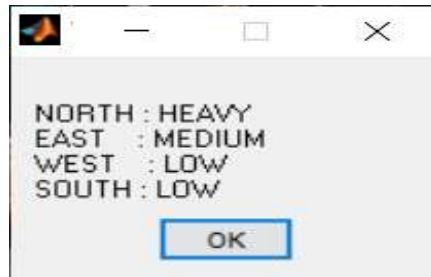Figure 5: Signal On North Side Turns On

Figure 6: Heavy Density Of Traffic In North

Figure 7: Signal On North Side Turns On

3. CONCLUSION

Thus, Image Processing Is Used To Detect Emergency Vehicle. Using Various Processes Of The Image Processing The Objective Is Achieved. The Traffic Density Is Determined. The Priority Is Given To The Road Detected With Emergency Vehicle Followed By The Road With Grater Traffic Density. Once The Traffic Signal Management Is Achieved The Signal Restores To Normal Operation Condition Where The Signal Switches Sequentially Between Each Of The Four Roads.
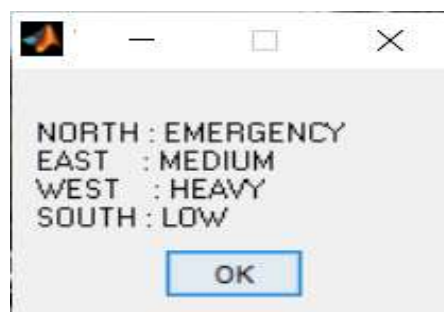

Figure 8: Detection Of Both Emergency Vehicle And Heavy Traffic Density

Figure 9: Signal On North Side Turns On (Emergency)

In The Discussed Methodology Input Images Are Directly Fed For The Image Processing And The Desired Output Is Achieved, The Future Scope Of This Work Would Be Directly Feeding The Input Video Files From A Web Camera Mounted On A Pole And Then Image Processing The Video Files By Converting Them Into Separate Image Frames.

4. REFERENCES

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