Casper- The Intelligent Software

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Abstract—Casper-The Intelligent Software, Implements The Basics Of Artificial Intelligence And Image Processing, To Facilitate The Function To Provide Identification Of An Object In Focus Of The Device. The Run-Time Application Is Swift Enough To Avoid Load On The Device. Deep Learning Algorithms Are A Subset Of The Machine Learning Algorithms, Which Aim At Discovering Multiple Levels Of Distributed Representations. Recently, Numerous Deep Learning Algorithms Have Been Proposed To Solve Traditional Artificial Intelligence Problems. This Work Aims To Review The State-Of-The-Art In Deep Learning Algorithms In Computer Vision By Highlighting The Contributions And Challenges From Recent Research Papers. It First Gives An Overview Of Various Deep Learning Approaches And Their Recent Developments, And Then Briefly Describes Their Applications In Diverse Vision Tasks. During Surveillance A Human Observer Is Required To Interpret The Video Footage And Identify The Objects Of Interests, Threats, Etc. If The Human Observer Is Replaced With Artificial Intelligence, All The Drawbacks And Limitations Of Human Are Eliminated And A Better And Aware Surveillance Is Created.This Aware Footage Interpreter Can Be Used In Various Fields Such As Security, Communication As Well As Commercial Monitoring. The Intelligent Footage Interpreter Can Be Used To Identify The Said Object. To Ensure Maximum Efficiency, The Frontend Will Be Cross Platform And Readily Available To Use On Any Device Which Has Internet Connection I.E. Pc, Android, Feature Phones With A Camera. The Backend Will Be Developed On Node Js Which Will Be Able To Communicate With All Platforms, Where The Artificial Intelligence Will Receive The Queries From Frontend, Recognize The Object In The Image And Sent The Client Identified Object.
Keywords—Artificial Intelligence; Image Processing; Deep Learning Algorithms; Security.

I.   Introduction

There Are A Lot Of Theories Based On Object Identification And Those Theories Are More Or Less Dependent Upon Logical Reasoning As Logical Reasoning Play An Important Role In The Implementation Of Any Solution To A Problem. There's A Huge Difference Between The Identification Done By Human And By Some Advanced Technology. Also, The Speed And Efficiency Plays An Important Role Here. But There Is An Efficient Technology Which Works More Smoothly And Discovers Various Patterns And Dimensions In The Process Of Identifying An Object. This Technology Is Called Artificial Intelligence Which Helps In Reducing The Human Interference. Artificial Intelligence And Image Processing, Together, Are Used To Implement The Function To Provide Object Identification. When The Picture Is Clicked, It Becomes Difficult To Extract And Render The Image And Most Importantly To Segregate It From The Background. Image Processing And Artificial Intelligence Work On This Aspect And Make The Identification Much Easier. The Aim Is To Identify The Object Correctly By Processing The Image. And Identifying The Image Even When The Surrounding Is Not Apt For The Same. Also, There Are Few Complications That Come Across While Implementing The Same. The Objects Which Are To Be Identified Could Be Of Any Shape Or Structure. This Makes It Difficult To Process The Image And Further Rendering It. And The Other Problem Is That The Object To Be Identified Is Always Surrounded By Few Other Objects Which Makes It Really Difficult To Focus On The One To Identified And Processing Of Such An Object Is Again Another Task Which Means Segregating It From The Background Objects. Also, Another Problem Is With The Light Effect Or The Shadow Which Makes It Difficult To Be Identified. Images Sometimes Become To Bright Or Dull Because Of The Surrounding Effect. But The High End Cameras Can Solve This Problem Easily. Applications Can Be Too Heavy On Devices Sometimes, But The Proposed System Is Efficient Enough To Avoid Load On The Device. Deep Learning Algorithms And Neural Networks Play An Important Role In This Implementation Of The Same. With Security Concerns Being Important Day By Day, It Becomes Important To Identify Each And Every Unidentified Object So As To Strengthen The Security System. Also, Identifying Of Such Objects Could Be Tedious. Manual Check And Security Surveillance Is Just Not Enough In Order To Identify Such Objects And Thereby It Becomes Mandatory To Bring Software Or Systems To The Picture. Casper- The Intelligent Software Aims To Review The State-Of-The-Art In Deep Learning Algorithms In Computer Vision By Highlighting The

Contributions And Challenges From Recent Research Papers. It Also, Gives A Brief About The Deep Learning Algorithms And Approaches And Also Their Latest Findings And Development. The Working Of Image Processing Along With Artificial Intelligence Makes It Possible To Identify The Objects Rightly. The Use Of Such A Software Will Help Make The Security System Get Strengthened And Thereby Making Its Application Effective At Places Like Malls And Few Other Public Places. The Working Will Be Effective As It Can Make A Difference Easily Between The Targeted Object And The Objects Surrounding It. Raw Computation Is Nearly Not Possible As It's Tedious And Therefore Neural Networks And Similar Approaches Are Encouraged In Order To Make The Entire Process Smoother.

II. Need Of Software

With The Growing Security Concerns And Advancements In The Direction Of Surveillance, It's Important To Incorporate New Technologies So As To Make The System Smoother And Avoid Or Reduce Human Interference. The Use Of Neural Networks In Sync With Shape Or Structure Based Approach Helps The Recognition And The Process Of Object Identification Work Correctly In Order To Identify The Objects. Feed Forward Approaches And Deep Learning Algorithms Make The System Run Effectively. Casper-The Intelligent Software Aims To Make The Surveillance System Smoother And To Create A Successful Object Identification Process. The Problem With The Identification Of An Object Is The Shape And Structure, Pointing And Mapping The Same Becomes A Difficult Task Which Means The Objects Available Are Of Different Shapes And Structures, So It's Difficult To Identify Them Based On The Same Since The Mapping Of Structure And Shapes Involves Deep Learning Algorithms And Image Processing And Rendering Techniques And Approaches. Also, Few Of The Applications Or Software Don't Facilitate The Function Of Adjusting As Per The Lighting Effect, Which In Turn Makes The Process Restricted And The Use Of Such A System Becomes Negligible. Few Of The Systems Work Only Without The Light, Which Again Becomes Very Tedious, As When The Lights Are On, The Identification Fails In Such A Case. Casper-The Intelligent Software Works In The Direction Of Attaining Object Identification Even When The Surrounding Is Not Favourable. The Need Of Safety, Security, Ease And Comfort Also Makes The Use Of Such A Setup Mandatory. The End Goal Of Casper Is To Identify The Object. The Classification An Image From The Rest Of The Images And The Extraction Of Such An Image Is A Crucial Process Which Is Handled By The Image Processing Method In Casper. This Functionality Enables The System To Segregate The Object In Focus From The Rest Of The Objects. This Recognition And Segmentation Is Also Another Task Involved In The Process, With The Help Of Artificial Intelligence And Neural Network Process Involved In It, This Becomes Possible And The System Successfully Launches With The Combination Of The Two

Technologies, Artificial Intelligence And Image Processing. Also, The Colour Effect Based On The Light Effect And The Pixelization Plays An Important Role Since The Sharpness Of The Edges Is Dependent Upon The Colouration And The Pixelization, Wherein The Light Effect Plays A Key Role In Managing The Brightness Of The Images Captured. Casper - An Intelligent Software Manages To Overcome The Weakness Of The Applications In Terms Of Identifying The Shapes Or Structures.

III. Literature Surveyed

As, Research Plays An Important Role In Implementation An Idea.The Research Done For Casper-The Intelligent Software Involves A List Of Surveys Done On The Papers Published Previously. The Basics Of The Image Processing And The Algorithms And Approaches Involved Are Covered By Xin Jia[1] In The Ieee Paper That Was Published In 2017, Which Strengthened The Understanding Of The Basic Concepts. The Understanding Of The Neural Networks Is Very Much Clear In The Explanations And The Use Of Deep Learning Algorithms Are Thoroughly Explained. Casper - The Intelligent Software Works In Implementing The Basics Found In Previous Papers And Thereby Making The Research More Strong By Adding The Advancements. Xuan Yang, Xiaoguang Chen, Jiancheng Zou And Maosen Wang[2] Has Explained The Concepts On Neural Networks In Depth In Their Paper. Casper -The Intelligent Software Implements Neural Networks In Artificial Intelligence. The Fundamentals Of The Image Processing And Artificial Intelligence Along With The Understanding Of The Algorithms Have Been Effectively Implemented Using Casper -The Intelligent Software. The Implementation Of The Deep Convolutional Neural Networks Has Been Explained By Michael T. Mccann [3] And Kyong Hwan Jin In Their Paper Which Was Published In 2017. Casper- The Intelligent Software Has Managed To Cover The Basics And Fundamentals Involved In Prominent Published Papers And Therefore Has Made Some Positive Changes Based On Study.

IV. Proposed System

The Intelligent Software Can Be Implemented By Using Concepts Of Image Recognition And Artificial Intelligence And Hence Can Be Divided Into Two Phases. In Image Recognition Phase, The Software Which Is Provided With A Camera Screen Captures The Image Which Is Processed And Further Matched With The One In Database And This Image Is Then Compared And Identified With The Help Of Artificial Intelligence. The Output Is The Image With The Name Of The Object Which Is Identified. The Process Involves Image Processing Techniques And Artificial Intelligence Algorithms Where The Main Aim Is To Identify Objects Irrespective Of Lightning Effects, Background And Other Distortions. Support Vector Machine (Svm) Is One Of The Most Popular Supervised Binary Classification Algorithm. Linear Svm Tries To Find The Best Line That Separates The Two Classes. Here, Linear Support Vector Machine Algorithm Is Used Because It's Easy And Precise. A Brief Description Of The Proposed System Is Now Given Which Starts With Decomposing Objects Into Smaller Entities Which Will Form As The Basis For Our Recognition System.
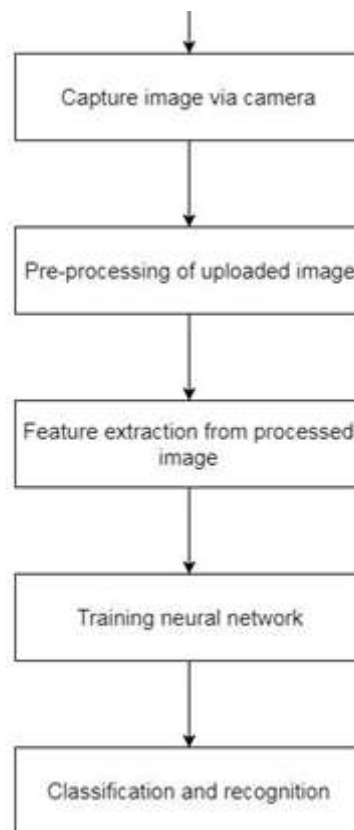

Fig 1. Flowchart Of Object Identifier

1. Pre-Processing

Pre-Processing Images Include Scanning The Image By Pixels And Performing Calculations Using Pixels And Surrounding Pixels. Firstly The System Processes Images With Different Pre-Processing Steps Like Edge Detection Where The Edge Pixels In An Image Are Found. Now The Generated Edge Pixels Create Contours Of Shapes Present In The Image And The Visible Shapes From This Resulting Image Are Extracted. Sometimes Extra Pre-Processing Is Done After These Steps And The Shapes Are Made More Appropriate For Training A Neural Network. It Involves Reducing The Number Of Ways A Shape Can Be Represented By Rotating Shapes To A Generalized Position And Reshaping The Shapes To A Single Size So That There Are Limited Projections For A Single Shape. This Reduces The Complexity In Training The Neural Network And Hence Enhances The Performance. This Extracts Different Entities That Form The Basis For Recognition By Neural System. It Is Done Because A Single Object Can Be Decomposed Into Many Shapes Depending On The Angle From Where It Is Captured.

2. Descriptor Creation

After Pre-Processing The Image And Extracting Different Shapes From The Captured Image The Shape Descriptors Are Created. The Shape Descriptors Are Created In Such A Way That They Contain Maximum

Information About The Shape And Such That Every Shape Is Distinguished From Other Shapes And Such That They Can Be Fed Into A Neural Network And Allow Them For Categorizing Them Easily. The Quality Of Descriptors Depend On How Well They Deal With Distortions Like Rotation, Scaling, Translation, Mirroring So That When A Shape Is Upside Down Or Other Position It Can Still Identify The Shape And Give Same Results As Shape In Normal Position. Also The Descriptor Captures As Many Possible Features Of The Object That It Can To Identify It And Distinguish From Others And Also A Small Change In The Represented Shape Does Not Change The Results.

3. Learning And Recognition

The Proposed System Is A Combination Of Both Image Recognition And Artificial Intelligence Where Feed Forward Neural Networks Are Used Since They Are Able To Generalize Well Among Objects And Hence It Can Easily Learn To Identify New Objects. Also They Can Very Well Handle Small Distortions Like Lightning, Rotation, Mirroring, Scaling, Translation. The Training Of System Can Be Of Supervised Or Unsupervised Phase And Is Trained By Using Different Samples Of A Single Shape. In The Learning Phase The Training Data Is Processed By The System And It Adapts Itself To Its Specifics. In The Recognition Phase The System's Recognition Capabilities Are Tested That Is What Is Has Learnt From The Training Phase.

It Consists Of Three Components Where The First Component Will Interpret The Shapes, The Next One Combining Those Shapes By Mapping Combinations Of Different Shapes To A Field And The Last One Being A Network That Interprets The Field And Classifies The Shapes.
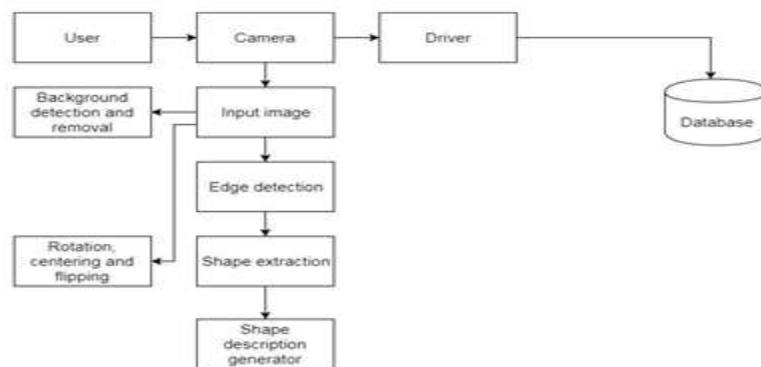

Fig 2. Block Diagram Of Image Processing

A. Advantages Of Proposed System
1. Provides Identification Of Objects Even In Non Favourable Surrounding Conditions Like Low Light Or More Brightness Or Even If The Object Is In Rotated, Scaled Or In Translated Form.
2. Strengthens The Security System By Assisting Humans In Monitoring The Surveillance By Identifying Objects Along With Their Name.
3. Reduces Human Interference And Therefore Eliminates Human Limitations In Monitoring The Surveillance And Hence Any Objects Do Not Go Unnoticed.
4. Objects Are Identified Along With Their Name Which Enables Human To Identify Objects About Which They Have No Prior Knowledge.
5. Easy And Efficient To Use Since It Uses Less Memory And Reduces Load On The Device.

V. Difficulties

There Are A Lot Of Difficulties Which Come Across In The Process Of Object Recognition. One Of The Major Problems Is With The Light, The Daylight May Differ With The Weather Conditions And It Affects The Image And Many A Times The Clarity Of The Image Also Gets Disturbed The Lighting. The Images Clicked In The Indoors And The Images That Are Clicked In The Outdoors Have A Huge Difference At Times Because Of The Lighting Effect. Also, The Shadow Sometimes Create Trouble And The Image Gets Distorted As The Clarity Gets Degraded. The Sharpness Of The Objects Play An Important Role In Identifying An Image. And Sometimes, The Sharpness Of The Image Is Not Tracked Properly Because Of The Light Effect And The Image Captured Get Disturbed And Hence The Identification Can Be Affected Due To This. The System Or The Software Must Capture The Image Properly And Identify The Image Even If The Lighting Is Not Appropriate. The Position Of The Object Could Be A Problem In Identifying The Image. The Image Needs To

Be Captured In A Way That Suits The Position Of The Object Placed. Otherwise It Becomes Difficult To Identify The Object. Also, The System Needs To Support The Object If It Is Rotated Or Translated. This Is A Big Problem As It Is Difficult To Render Such An Image. The Objects Come In Different Shapes Or Structures, Identification Of Objects Must Facilitate The Functionality Of Identifying An Object Of Any Sizes Or Shapes.

VI. Future Scope

The Main Reason For Wanting To Build A Software That Can Identify Objects Is To Make The Computer Interact With Real World. There Are Many Questions On Capabilities Of Robots Hence They Can Be Trained In Future And Then Identify The Vision And Assign Meaning To What They See.

The Intelligent Software Can Be Integrated With Scanners So That An Automated System Would Help Humans In Identifying Dangerous Objects In Luggage Which Sometimes May Go Unnoticed.

VII. Conclusion

The Software Uses Image Processing To Capture The Image Via A Device Containing And Processes The Image On The Basis Of Identifying Texture Patterns And Uses Artificial Intelligence To Detect The Object Along With Its Name. Hence It Can Be Integrated With Potential Devices In Order To Attain The Goal Of Security As It Assists Human In Monitoring The Surveillance And Also Overcomes Human Limitations In Monitoring Of Surveillance. The Input Will Be An Image And The Output Being An Image With The Identified Object Along With Its Name. Since Image Processing And Artificial Intelligence Work Hand In Hand The System Can Work Smoothly When Integrated With Other Devices.

Acknowledgement

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