International Journal of Innovative Research in Engineering & Management (IJIREM)
ISSN: 2350-0557, Volume-10, Issue-2, April 2023
https://doi.org/10.55524/ijirem.2023.10.2.22
Article ID IJIR2362, Pages 115-117
www.ijirem.org

Leveraging Image Processing for Cloak Invisibility

GiriBabu Sadineni[1], Janardhan Reddy D[2], P. Triveni[3], D. Bhargavi[4], G. Mani Chandana[5], K. Naga Neha[6], and V. Divya[7]

[1]Associate Professor, Department of Computer Science & Engineering, PACE Institute of Technology & Sciences, Ongole, Andhra Pradesh, India
[2]Assistant Professor, Department of Computer Science & Engineering, PACE Institute of Technology & Sciences, Ongole, Andhra Pradesh, India
[3,4,5,6] UG Student, Department of Computer Science & Engineering, PACE Institute of Technology & Sciences, Ongole, Andhra Pradesh, India

Correspondence should be addressed to GiriBabu Sadineni; janardhanreddy_d@pace.ac.in

ABSTRACT- Substance classified as retro-reflective is used to make the cloak, which is used for visual concealment purposes. Particles of retro-reflective substance occupy a broad surface area. It's impossible to tell where the flashes of illumination come from as they hit these beads. Utilizing the color information of a certain colour, we must obscure the picture's backdrop in this application. I'm utilizing red, black, blue, and white to create the above notion. The programme will translate the shade to HSV style and pick the correct top and bottom limit values to identify the hue variations and then conceal it if the colour is present in the picture.

KEYWORDS- Image Processing, Hue, Color Information, Cloak Invisibility

I. INTRODUCTION

Computer vision was introduced in the late 1960s as a result of the progression of Artificial Intelligence [1]. By deploying video camera into the illusionary mechanisms, the goal was to make them more intelligent by mimicking the sentient pictorial scheme and describing what they saw in the same way. [2] A 3D object in a 2D photograph should be detectable by device perception. Whether it 's something happening right now or something that happened in the past, each photograph narrates a series of stories [3]. Python's OpenCV is an public source repository for device perception. Intel introduced it in 1999 [4]. Since then, it has been reworked to focus on device perception in actual environments. [5] C and C+ were used to write the code for this library. It is compatible with both Windows and Linux [6]. Python, MATLAB, Ruby, and other programming dialects can be quickly integrated with this repository. Using Python language [7], picture recognition (structure and colour recognition) is a breeze.

II. RELATED WORK

"Contour, Forms, and Color Detection with Open Cv Library of Python" was investigated by [8] and it was discovered that Python 2.7, Open Source Computer Vision Library, and Numpy can detect the contours, objects, and colours of various geometrical shapes in binary pictures. In order to process the photographs, which included loading them and identifying distinct shapes and colours within the sample images, the most important functions were used [9].

OpenCV for Computer Vision Applications" taught [10] that image processing was designed to aid the computer in understanding a picture's contents [11]. For image processing, OpenCV was an excellent set of functions [12]. Because of this, computer vision apps now have a de-facto standard API to use. Image processing applications may be used to tackle a wide range of real-time challenges [13].

They found [14] that C/C++, a computational programming language, may be used to develop computationally complex programmes in C or C++ and generate Python shells. Every aspect of recognition, from its fundamentals to alternative methods of obtaining it, was covered in great detail [15]. As far as computer vision goes, Python was selected over MATLAB because it takes less time to simulate than MATLAB does.

III. PROPOSED METHODOLOGY

Green screening does not apply in this situation. This is similar to green screening in that the backdrop is eliminated but the forefront is also eliminated. Cloaks made of crimson fabric are employed in this case. In order to utilize any colour, we just need to edit a few lines of code. fig. 1 depicts the processes to be performed in order create the increased output. Acquire and save the backdrop shot : This will be done for some seconds. The fundamental notion is alternating the current frame image component corresponding to the material with the background pixels, so that we acquire the special impact of invisibility. Thus, we're obliged to preserve a frame of the background. It would just take a couple of minutes to capture and save the background. Use the colour recognition and separation method to locate the red cloak. The proper idea is to convert the colour space of the image from RGB to HSV. When it comes to our cloak, the main benefit of adopting the H.S.V colour space is that the hue is used to represent the colour or spectrum. Utilizing the R.G.B. to H.S.V colour space transformation, we will first record a

live frame, and then specify an acceptable range of H.S.V values [12]. To become invisible, we donned an invisibility cloak made of crimson cloth [13]. Red was the primary focus of attention in the backdrop. To get the masking from an RGB-valued image, it is tempting to just cutoff the R-value stream. Due to the sensitivity of RGB frequencies to light, we may conclude that this will not function. [8] In order to do this correctly, we must convert our image's colour format from RGB to HSV. For the red colour spectrum, we use mask1=mask1+mask2 to combine our masking. Creating a covering to separate the red cloth from the rest. Once the mask has been fine-tuned, it will be put to use to separate the cloth from the frame. Construct an Invisibility cloak using the ultimate boosted result. Eventually, we will get an improved result by substituting the squares of the identified red-colored portion of the fabric with comparable dots of the backdrop.

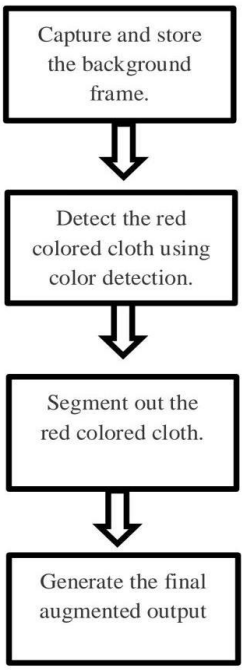

Figure 1: Proposed Methodology

IV. RESULTS AND DISCUSSION

In this work, we'll use a certain colour space to obscure the video's backdrop. Red, black, blue, and white are the colours I'm utilizing to illustrate the aforementioned notion. Any colour in a submitted video that falls into this category will be converted to HSV format by the programme, which will then use suitable upper and lower bound values to determine the color's range and subsequently conceal it. The results are shown from Fig. 2 to Fig. 5.

Figure 2: Invisibility Cloak Home page

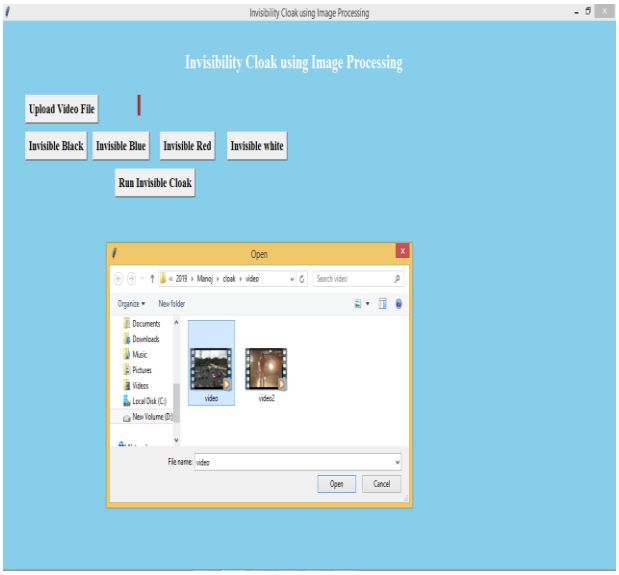

Figure 3: Upload Video File

Figure 4: Person with black color is visible

Figure 5: Person with black color is invisible

V. CONCLUSION

Using this incredible innovation, items or people may be made to appear or disappear. Researchers will keep pushing the frontiers of the innovation, which has certain restrictions, but they won't last forever. This technique, therefore, has a fascinating implications that has less to do with hiding items and more to do with bringing them to light. There is a notion known as "Reciprocal Teleexistence," which means functioning and seeing as if you were in many locations at the same time. When gamers use portable screens to roam the globe, sensors collect data about their surroundings, particularly their position. Players are given a playing environment that adapts to their location and what they are doing.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

REFERENCES

[1] Y. Shi, W. Tang, L. Li and C. Liang, "Three-Dimensional Complementary Invisibility Cloak With Arbitrary Shapes," in IEEE Antennas and Wireless Propagation Letters, vol. 14, pp. 1550-1553, 2015, doi: 10.1109/LAWP.2015.2412171.

[2] Y. Takano, T. Nagayama and A. Sanada, "Constant Permeability Design of Cylindrical Invisibility Cloaks with Hyperbolic Coordinate Transformation Based on Transformation Electromagnetics," 2018 Asia-Pacific Microwave Conference (APMC), 2018, pp. 192-194, doi: 10.23919/APMC.2018.8617298.CC

[3] F. Huo, L. Li, T. Li, Y. Zhang and C. Liang, "External Invisibility Cloak for Multiobjects With Arbitrary Geometries," in IEEE Antennas and Wireless Propagation Letters, vol. 13, pp. 273-276, 2014, doi: 10.1109/LAWP.2014.2304640.EE

[4] T. Nishizawa and A. Sanada, "Cylindrical Distributed Immittance Shells for Microwave Invisibility Cloak," 2018 Asia-Pacific Microwave Conference (APMC), 2018, pp. 189-191, doi: 10.23919/APMC.2018.8617436.GG

[5] V. I. Vyunnik and A. A. Zvyagintsev, "Numerical methods of calculation transformation matrixes at designing nonsingular invisibility cloak-carpet," 2012 6th International Conference on Ultrawideband and Ultrashort Impulse Signals, 2012, pp. 240-242, doi: 10.1109/UWBUSIS.2012.6379793.

[6] R. Dehbashi and M. Shahabadi, "External Cylindrical Invisibility Cloaks With Small Material Dynamic Range," in IEEE Transactions on Antennas and Propagation, vol. 62, no. 4, pp. 2187-2191, April 2014, doi: 10.1109/TAP.2014.2301991.

[7] Y. Takano and A. Sanada, "Polarization independent isotropic near-zero-index metamaterials composed of dielectric spheres for 3-D invisibility cloaks," 2017 IEEE Asia Pacific Microwave Conference (APMC), 2017, pp. 345-348, doi: 10.1109/APMC.2017.8251450.

[8] W. J. R. Hoefer, G. Park and E. Li, "Time domain study of electromagnetic cloaks for wideband invisibility under transient illumination," 2010 IEEE MTT-S International Microwave Symposium, 2010, pp. 89-92, doi: 10.1109/MWSYM.2010.5518226.

[9] T. Nagayama and A. Sanada, "Specular reflection from a sinusoidal periodic boundary by a carpet cloak of invisibility," 2013 Asia-Pacific Microwave Conference Proceedings (APMC), 2013, pp. 1209-1211, doi: 10.1109/APMC.2013.6695073.

[10] T. Ergin, N. Stenger and M. Wegener, "Three-dimensional invisibility-cloaking structure at optical frequencies," CLEO/QELS: 2010 Laser Science to Photonic Applications, 2010, pp. 1-2, doi: 10.1364/QELS.2010.QTuH2.

[11] Shengying Liu, Q. Wu and K. Zhang, "Dispersion effect on electromagnetic properties of metamaterials invisibility cloak," Proceedings of 2011 Cross Strait Quad-Regional Radio Science and Wireless Technology Conference, 2011, pp. 226-229, doi: 10.1109/CSQRWC.2011.6036927.

[12] S. Xu et al., "Electromagnetic invisibility cloaks based on inverse design method," Proceedings of 2014 3rd Asia-Pacific Conference on Antennas and Propagation, 2014, pp. 1065-1068, doi: 10.1109/APCAP.2014.6992692.

[13] M. H. Jyothi, D. V. Bipin, B. Choudhury and R. U. Nair, "Design of conformal metamaterial unit cells for invisibility cloaking applications," 2016 IEEE Annual India Conference (INDICON), 2016, pp. 1-5, doi: 10.1109/INDICON.2016.7838979.

[14] S. Jamilan and E. Semouchkina, "Employing GRIN PC-Inspired Approach for Building Invisibility Cloak Media from Photonic Crystals," 2018 IEEE Photonics Conference (IPC), 2018, pp. 1-2, doi: 10.1109/IPCon.2018.8527322.

[15] Y. Takano and A. Sanada, "Infinite-Area Isovolumetric Transformation for Electromagnetic Invisibility Cloaks Based on Transformation Electromagnetics," 2018 48th European Microwave Conference (EuMC), 2018, pp. 679-682, doi: 10.23919/EuMC.2018.8541749.