IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 3, March 2016

Making things invisible using Optical Camouflage Technology

Rahul.T[1], RathinaMurugan.R[2]

UG Scholar, Instrumentation & Control Engg., Sri Manakula Vinayagar Engineering College, Puducherry[1]

UG Scholar, Electrical and Electronics Engineering, Sri Manakula Vinayagar Engineering College, Puducherry[2]

Abstract: In many science fiction movies invisible things are seen. This paper describes the technique of making things invisible by optical camouflage technique. The things to be made invisible is coated or covered with retro reflection material. A projector is used to mask the covered material making object virtually transparent. Capturing the background image requires a video camera, which sits behind the person wearing the cloak. The video from the camera must be in a digital format so it can be sent to a computer for image processing using image based rendering technical. There are some useful applications for this simple but astonishing technology.

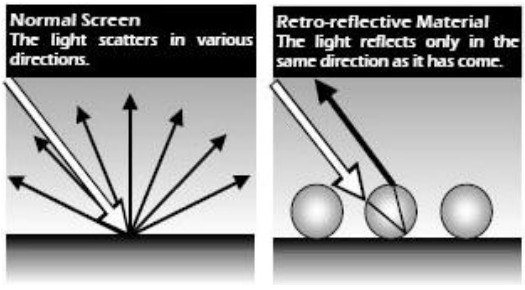
Keywords: Optical Camouflage Technology, Retro-Reflective material, Head Mounted Projector (HMP).

I. INTRODUCTION

Optical camouflage is a kind of active camouflage. This concept is very simple. If a masked object is masked by the projected image, the masked object appears as if it is virtually transparent. The cloak used in this technique is made of a special material known as retro-reflective material. To create invisibility or transparent illusion we need video camera, projector and combiner the applicable criteria that follow.

II. RETRO-REFLECTION

The cloak used to make the object is made of a special material known as retro-reflective material. It is made of thousands and thousands of small beads. When the light rays fall on these beads, the light rays bounce back in the same direction from which they come. This type of reflection is peculiar. To understand its uniqueness look how light reflects on other surfaces. A rough surface produces a diffused reflection because the incoming radiations gets scattered in all possible directions. Perfectly smooth surfaces like mirror creates speculate reflection (a reflection in which incident light rays and reflected light rays form the exact same angle with the mirror surface). In retro reflection, the glass beads act as a prism, which bends the incident light rays by a process known as refraction. This makes the reflected light rays to travel back along the same direction as that of incident light. Retro-reflective materials are more common nowadays. Traffic signs, road markers etc., are the applications of retro –reflection which will be more visible to people driving at night.



III. ROLE OF VIDEO CAMERA AND COMPUTER

A. Camera:

The retro-reflective cloak does not make the object invisible. The fact is that it is completely opaque. The cloth just creates an illusion of invisibility by acting like a screen projecting the background. To capture the background image a camera is required. It is kept behind the object or person covered with retro - reflection cloak. The video of the background is sent to computer in digital format for processing. The title or heads unless they are unavoidable.

B. Computer:

All augmented reality systems rely on computer to synthesize graphics and superimpose them on a real world image. For optical camouflage technique, the hardware and software combo must take the captured image from the camera, calculate the appropriate perspective to simulate reality and transform the captured image into the image that will be projected onto the cloak. This technique of image processing is known as image based rendering.

IV. ROLE OF PROJECTOR AND COMBINER

A. Projector:

The processed image is to be projected on the cloak which acts as a moving screen. This is achieved by a projector which projects the light beam through an opening which is controlled by a device called Iris diaphragm. An iris diaphragm is made of thin, opaque plates, and turning a ring changes the diameter of the central opening. For a perfect optical camouflage to occur this opening should be at a size of pin hole. This ensures larger depth of field so that the screen (here the cloak) can be placed at any distance from the projector.

B. Combiner:

The system requires a special mirror to both reflect the projected image toward the cloak and to let light rays bouncing off the cloak return to the user's eye. This special mirror is known as beam splitter or a combiner. If it is properly placed in front of the user, it allows the user

DOI 10.17148/IJARCCE.2016.53147

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 3, March 2016

to perceive both the image enhanced by the computer and external light from surrounding. This is critical because the computer generated image and the real world scene must be fully integrated for the illusion of invisibility to be real. The user has to view through the pinhole in this mirror to see the reality.

V. COMPLETE WORKING OF THE TECHNIQUE

Let us cascade all the above steps to see how does the invisibility cloak makes the object invisible. The fig.2 explains the arrangement made for the process. Once the object or person is covered with the retro-reflective cloak, the following sequence is done.

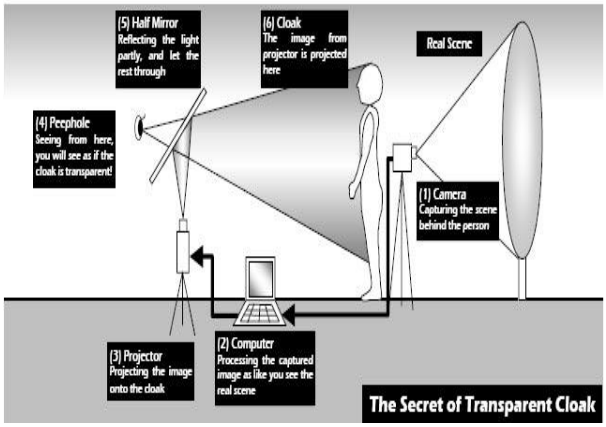


Fig.2 Complete working

- The digital camera captures the scene behind the object covered with the retro-reflective cloak.
- The captured scene is processed by the computer and necessary calculations are made to adjust the still image or video to look realistic.
- This processed image or video is sent to the projector which shines the image or video through the pinhole sized opening onto the combiner.
- The silvered half of the mirror bounces back the projected image or video towards the objected or person covered with cloak.
- The cloak reflects back the projected image or video back to the mirror.
- Light rays bouncing through the cloak passes through the transparent mirror and falls on the user's eye. The objector person covered by the cloak appears invisible because the background scene is displayed on the retro-reflective material while light from the environment is also allowed to fall on the user's eyes.

VI. REAL-WORLD APPLICATIONS

Let While an invisibility cloak is an interesting application of optical camouflage, it's probably not the most useful one.

Here are some practical ways the technology might be applied:

- Pilots landing a plane could use this technology to make cockpit floors transparent. This would enable them to see the runway and the landing gear simply by glancing down.

- Doctors performing surgery could use optical camouflage to see through their hands and instruments to the underlying tissue.
- Providing a view of the outside in windowless rooms is one of the more fanciful applications of the technology, but one that might improve the psychological well-being of people in such environments.
- Drivers backing up cars could benefit one day from optical camouflage. A quick glance backward through a transparent rear hatch or tailgate would make it easy to know when to stop done.

VII. CONCLUSION

This technology makes objects or persons invisible or transparent. This technology is shown in movies like harry potter as a kind of magic. It is a very useful technique which can be used for safety reason, protection, army, etc. It may have some limitations but it won't be for long as scientists continue to work on it.

REFERENCES

[1.] R. Azuma and J. Rolland, A Survey of Augmented Reality, Presence: Teleoperators and Virtual Environments, Vol.6, No.4, pp.355 – 385, 1997

[2.] M. Inami, N. Kawakami, Y. Yanagida, T. Maeda and S.Tachi, Method and Device for Providing Information, US PAT. 6,341,869, 2002