# Stop Motion Goggle

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## 1 Introduction

Stop Motion Glasses (SMG) expands your visual perception of moving objects by allowing you to perceive visual information selectively through a high speed shutter. In this system, you can easily observe not only periodic rotational motion such as rotating fans or wheels, but also random motion like a jumping ball. SMG can be considered as a time domain sunglasses. Sunglasses enables easy viewing of surroundings by cutting off bright light, on the other hand, SMG makes it easy to see moving object by temporally controlling optical density. In addition, SMG deblurs artifacts due to fast moving object over a short exposure time. This system induces similar physiologic effects of Stroboscope in dark environment that augments human visual perception of moving objects anywhere as a simple wearable device.

## 2 Technology

SMG used a DisplayTech ferro-electric shutter as a high speed shutter (Figure 1). The ferro-electric shutter's on/off contrast is high (500 : 1) and switching time is less than 100 microseconds.



Figure 1: Stop Motion Goggle

With our technology, we control an exposure time which is determined from the shutter's on/off ratio and frequency. It can be said that this way is a same as adjusting shutter speed and a frame rate when we use a video camera. Most suitable value of these to easily observe moving objects depends on a movement velocity of objects and characteristics of human visual perception.

From our experimental results, suitable value of on/off ratio is 2% and frequency is 25 Hz at the object which does horizontal uniform motion with 140 degree per second.

## 3 Application

SMG enables users to easily observe moving objects. For example, the users can observe a shape of a rotating fan and perceive character on the fan blade (Figure 2). SMG can be used for other motion such as uniform motion (Figure 3) and random motion (Figure 4).
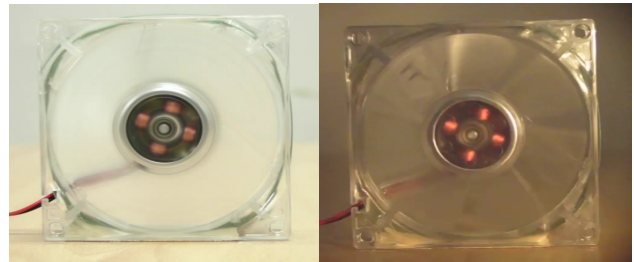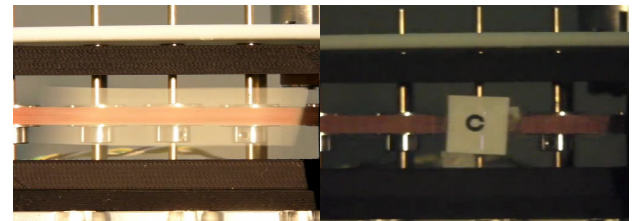


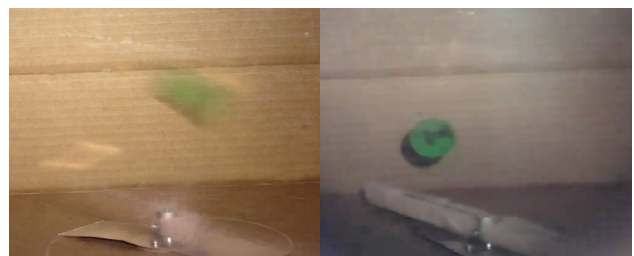Figure 2: Rotating motion



Figure 3: Uniform motion



Figure 4: Random motion