Reduction of Video Data Obtained from Aerial Inspection of Wire

Background

Aerial inspection of wire gives information on where wires of transmission lines have been damaged. Utility companies use a helicopter to obtain such information by taking a video of the wires. Inspectors examine the video to identify the places where the wire is damaged. It takes 5 hours to scan a one-hour video, because inspectors watch the video very carefully. This inspection is a very difficult task. Thus a system to make the task easier is needed.

Objectives

In order to simplify the inspection task of faulty wires by watching a video, to develop a means of reducing of video data by removing images where there is no faulty wire.

Principal Results

1. Reduction System of Video Data Obtained from Aerial Inspection of Wire

(1) Stable extraction of wire

First, the system stores a reference brightness pattern of the wire. It searches the wire in the image using this brightness pattern. While wire is scanned, the brightness pattern is renewed every 10 seconds. Updating the brightness pattern allows the system to avoid the affect of changes in the light conditions and to extract wire images stably.

(2) Detection of a cut wire

As shown in Fig.2, the system first calculates the contour of the wire. Next, using the contour, the system estimates a line that expresses a nonfaulty wire. Finally, by comparing the contour and the line, the system judges whether the wire is cut.

(3) Detection of an arc mark

An arc mark is darker than the rest of the wire. If a portion is darker than the mean brightness of the wire, then the wire may have an ark mark.

(4) Robust wire tracking

There is not always a wire in an image, because strong wind shakes the helicopter and the camera cannot photograph the wire. When this happens, the system records the image as a processing failure image. The system keeps searching for the wire on images and records images as processing failure until the wire appears. Once the wire appears, the system extracts the wire image and scans it.

2. Effect of the developed system

Five videotapes were examined using the system. Each video is 1 hour long. About 60% of the wire in the video was defined as nonfaulty. The images in which the system judged as showing a faulty wire included all of the actual faulty wires. This means a 60% reduction of the scanning time by an inspector, and the 5-hour the task of scanning one videotape was reduced to 2 hours.

Future Developments

The rate of reduction of scanning time depends on the performance of detecting arc marks. Thus we will improve the system performance to approximate the inspector's performance identifying arc marks using pattern classification..

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Reference

R.Ishino et al, 2004, "Detection System of Damaged Cables Using Video Obtained from an Aerial Inspection of Transmission Lines" Proc. of IEEE Conf. on PES General Meeting

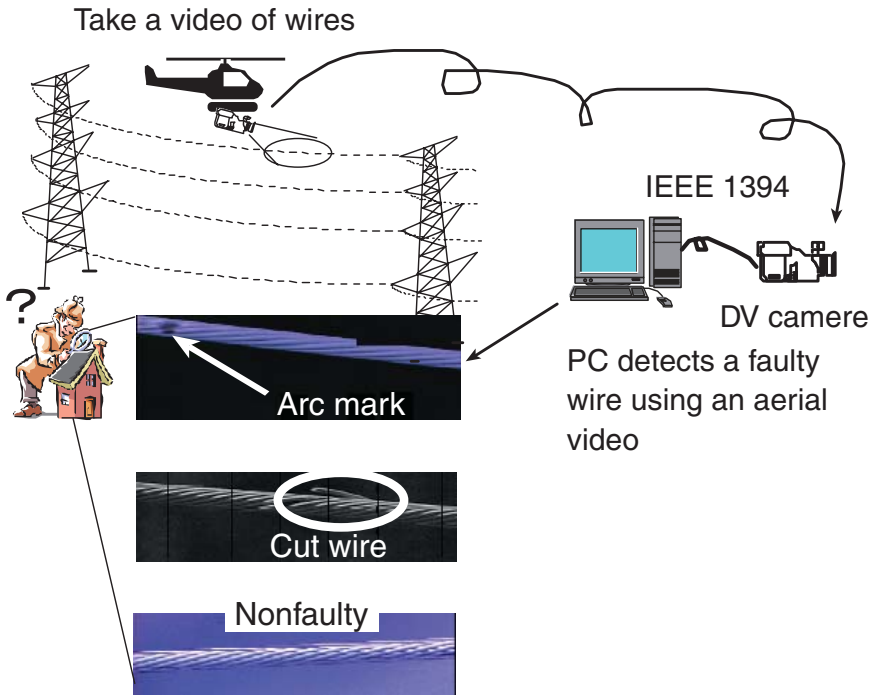
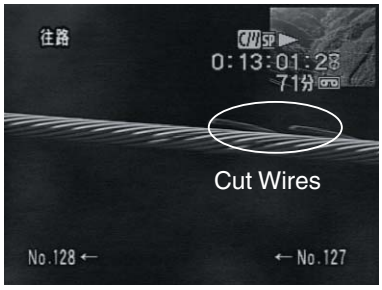
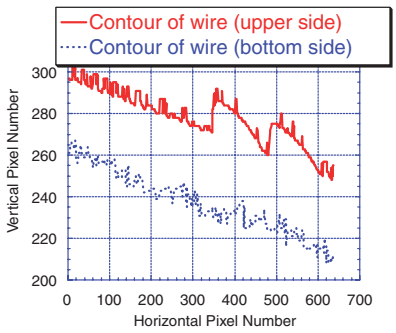


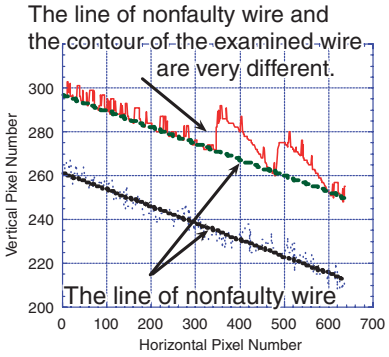
Fig.1 Reduction System of Video Data Obtained from Aerial Inspection of Wire



(a) Cut wire



(b) Contour of wire



(c) Comparison line of nonfaulty wire and contour of wire

Fig.2 Detection of a cut wire

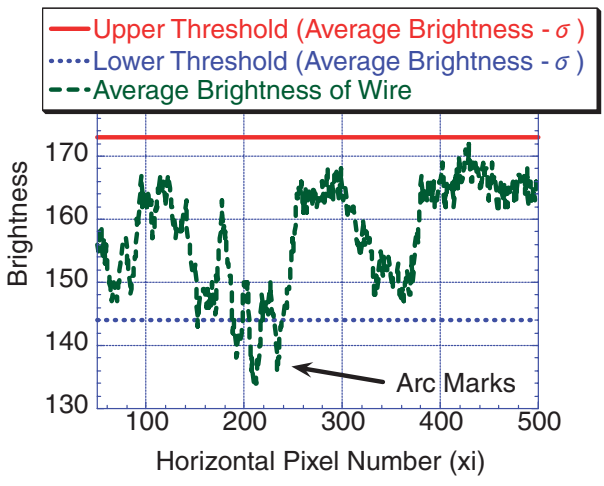


Fig.3 Detection of an arc mark