The Design of an Automatic Tactile Inspection System

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Abstract

The main purpose of this paper is to create a tactile testing mechanism for a tact switch. In this paper, the fundamental principle of a tact switch will be discussed. Moreover, the tactile testing machine composed of a sensor, a controller, an actuator, and a mechanism has been introduced. According to the special characteristics of a tact switch, a testing method for the tactile test has been developed and programmed by using a visual basic language. In this tactile testing machine, four kinds of components have been integrated together so that the tactile testing for the tact switch can be performed automatically. Before the tactile testing machine is operated, a complete calibration procedure for the system is performed so as to assure a high precision system. Moreover, to verify the reliability of the tactile testing system, three kinds of products are individually tested 100 times. The testing results reveal that the error range of both the maximal acting force and elasticity ratio in the tactile test system is extremely low with experimental repeatability remaining in tact. Therefore, the tactile testing system is accurate and stable. Consequently, the tactile testing system will automatically provide a quick and precise tactile inspection for the automation machine.

Keywords: Tact switch, Tactile

1. Introduction

Touch and tactile sensors are devices which measure the parameters of a contact between the sensor and its object. This interaction obtained is confined to a small defined region. This contrasts with a force and torque sensor which measures the total force being applied to an object. Tactile sensing is the detection and measurement of the spatial distribution of forces perpendicular to a predetermined sensory area and the subsequent interpretation of the spatial information. A tactile-sensing array can be considered to be a coordinated group of touch sensors. The minimum requirements for a good sensor are self diagnostics and calibration and testing. Tactile sensation of a human is a fundamental talent. Therefore, much of the knowledge is drawn from investigation of human sensing and the analysis of grasping and manipulation [1, 2, 3, 4, 5, 6]. However, for a given tact switch widely used in pc and electronic components, the tactile test will be different depending upon the person’s race, age, sex, physical condition, and psychology. In order to overcome drawbacks of product quality, the development of an intelligent tactile testing system used with tact switches is necessary. Very little commercial success has been accomplished so far largely because of the problems encountered in transferring the technology involved from the research laboratory to industry. In all tactile sensors the problem is information processing and interconnection. In this paper, a complete technology is applied to the tactile testing system. By using the automatic tactile testing not only is the inspection time economically saved but the quality of the tact switch is also highly improved.

2. Structure of Tact Switch

2.1 Mechanism of Tact Switch

As indicated in Figure 1, the tact switch is composed of a pressed plate, a push button, a movable plate, and a cover. The function of each component is described below.

(A) Pressed Plate:
A metal plate made by a press machine is used to fix the position of a push button and a movable plate.

(B) Push Button:
A plastic element made by an ejection machine is used to transmit the pushing force to the movable plate to trigger the ON/OFF motion. Moreover, because of its plastic property, it has an anti-electric-conductivity function.

(C) Movable Plate:
A metal plate formed into a curved plate by a press machine is used to change the status of ON and OFF because of the elastic deflection.

(D) Cover:
It is a metal conjunction made by a press machine. The cover, the main body of a trigger switch, including two sets of metal conjunctions inside and one set of fixed points outside that combine the plastic and metal