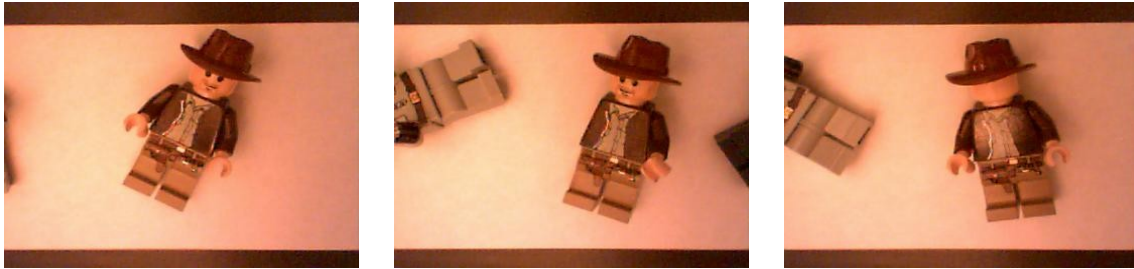


## ***Production Line Visual Inspection : “Indy” Toy Production Plant***



### **Background**

*The most common use of image processing in an industrial setting is for the automated visual inspection of products leaving a production facility. Automated inspection is used to inspect everything from pharmaceutical drugs to textile production. It is estimated that the majority of products bought on shop shelves are inspected using automated “machine vision” based systems prior to dispatch. Why? - to avoid the cost of shipping a faulty or sub-standard item to a supermarket shelf that no-one wants to buy!*

In this practical exercise we are dealing with a toy production line in a facility producing toy “Indiana Jones” characters for the domestic market. We have a set of images, taken under near constant factory lighting conditions, of the toys as they leave the production line. The toy company require a vision system to automatically identify a number of different faults that may occur during the assembly and printing stages of production so that these toys can be intercepted prior to packaging.

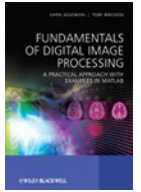
Your task is to design and prototype a image processing system to detect the set of fault conditions that may occur together with identifying the type of fault that has occurred. You will develop this prototype system using Matlab and the techniques discussed in the book.

### **Task Specification – Automated Visual Inspection**

You are required to develop a visual inspection system that correctly identifies each of the following fault conditions that may occur in the production plant:

1. toy character is **missing hat**
2. toy character is **missing face printing**
3. toy character is **missing a leg**
4. toy character is **missing body printing**
5. toy character is **missing a hand**
6. toy character is **missing a head**
7. toy character is **missing an arm**

In each image we are **only interested in classifying the central character in the image**. One image is taken for each version of this character leaving the production line so faults occurring in characters on either side or other non “Indiana Jones” will be detected separately by an additional system as this is a multi-product line. Additionally, some images may have no character in the centre of the image – this is not a fault, just a gap in the production flow stemming from a machine operating further up the line. *Faults with side characters, missing characters and other characters must be ignored by your system – only the seven faults above must be reported for the Indiana*



*Jones character.* You can tackle each of the cases in any order you wish.

Some examples will contain more than one fault with the toy character but these cases are rare – identify as many as you can.

In implementing your solution consider the functionality available in the Matlab Image Processing Toolkit. As this is only a prototype – efficiency of your approach is less important than performance.

### **Sample Data**

The sample data provided is a set of 123 images of toy characters leaving the hypothetical production facility. They have been additionally split into labelled sets for ease of prototype development. The images have been captured by a high-speed image camera as they leave the facility – although no motion blur occurs in the images, the positions of the characters in the image varies significantly from image to image.

These are provided as a set of zip archive files on the book website (<http://www.fundipbook.com/materials/>).

**Supporting Matlab Code:** We additionally provide a Matlab code example `dir_cycle.m` which provides an easy means to cycle through a given set of files in a specified directory (such as one of the directories provided by extracting the sample data zip archives). The example simply displays each of these images (very quickly, one after another) – the processing for the fault detection is left to the reader! (available from the book website – <http://www.fundipbook.com/materials/>)

*For instructors use only: A sample marking scheme and further detailed assignment specifications, including an unreleased/unseen test set to form part of a marking scheme, are available to instructors upon request (email from a faculty address with URL of your course page). This is intended only where the task is being set as a course assignment.*