

# Visual Inspection of Motorcycle Connecting Rods



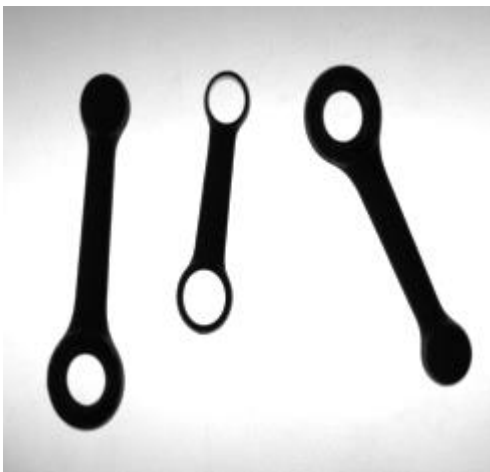
Students should develop a software system aimed at visual inspection of motorcycle connecting rods. The system should be able to analyse the dimensions of two different types of connecting rods to allow a vision-guided robot to pick and sort rods based on their type and dimensions. The two rod types are characterized by a different number of holes: Type A rods have one hole whilst Type B rods have two holes.

## First Task

- **Image characteristics**

1. Images contain only connecting rods, which can be of both types and feature significantly diverse dimensions.
2. Connecting rods have been carefully placed within the inspection area so to appear well separated in images (i.e. they do not have any contact point).
3. Images have been taken by the backlighting technique so to render rods easily distinguishable (i.e. much darker) from background. However, for flexibility reasons the system should not require any change to work properly with lighting sources of different power.

Two exemplar working images are provided below:



- **Functional specifications**

For each connecting rod appearing in the image, the vision system should provide the following information:

1. Type of rod (A or B).
2. Position and orientation (modulo  $\pi$ ).

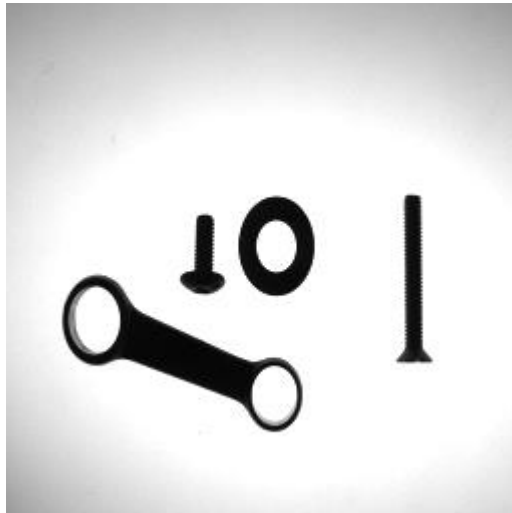
3. Length (L), Width (W), Width at the barycenter ( $W_B$ ).
4. For each hole, position of the centre and diameter size.

### **Second Task**

While still meeting the requirement of the First Task, students should modify the system in order to deal with one (or more) of the following three changes in the characteristics of the working images:

1. Images may contain other objects (i.e. screws and washers) that need not to be analysed by the system (such kind of objects are often referred to in computer vision as “distractors”).
2. Rods can have contact points but do not overlap one to another.
3. The inspection area may be dirty due to the presence of scattered iron powder.

Exemplar working images corresponding to the three changes are provide below:



Change 1.



Change 2.



Change 3.

### **Working Images**

#### **First Task:**

Tesi00.bmp, Tesi01.bmp, Tesi12.bmp, Tesi21.bmp, Tesi31.bmp, Tesi33.bmp.

#### **Second Task**

1. Tesi44.bmp, Tesi47.bmp, Tesi48.bmp, Tesi49.bmp.
2. Tesi50.bmp, Tesi51.bmp.
3. Tesi90.bmp, Tesi92.bmp, Tesi98.bmp.