Automatic Road Detection

❖ Automatic Road Detection is particularly employed in the city Planning, Cartography and to revise already detected roads in Geography information System Environment.

❖ One unique thing it is the objective of road feature extraction method is providing a binary mask in which true pixels represents road regions and false pixels indicate non-road regions.

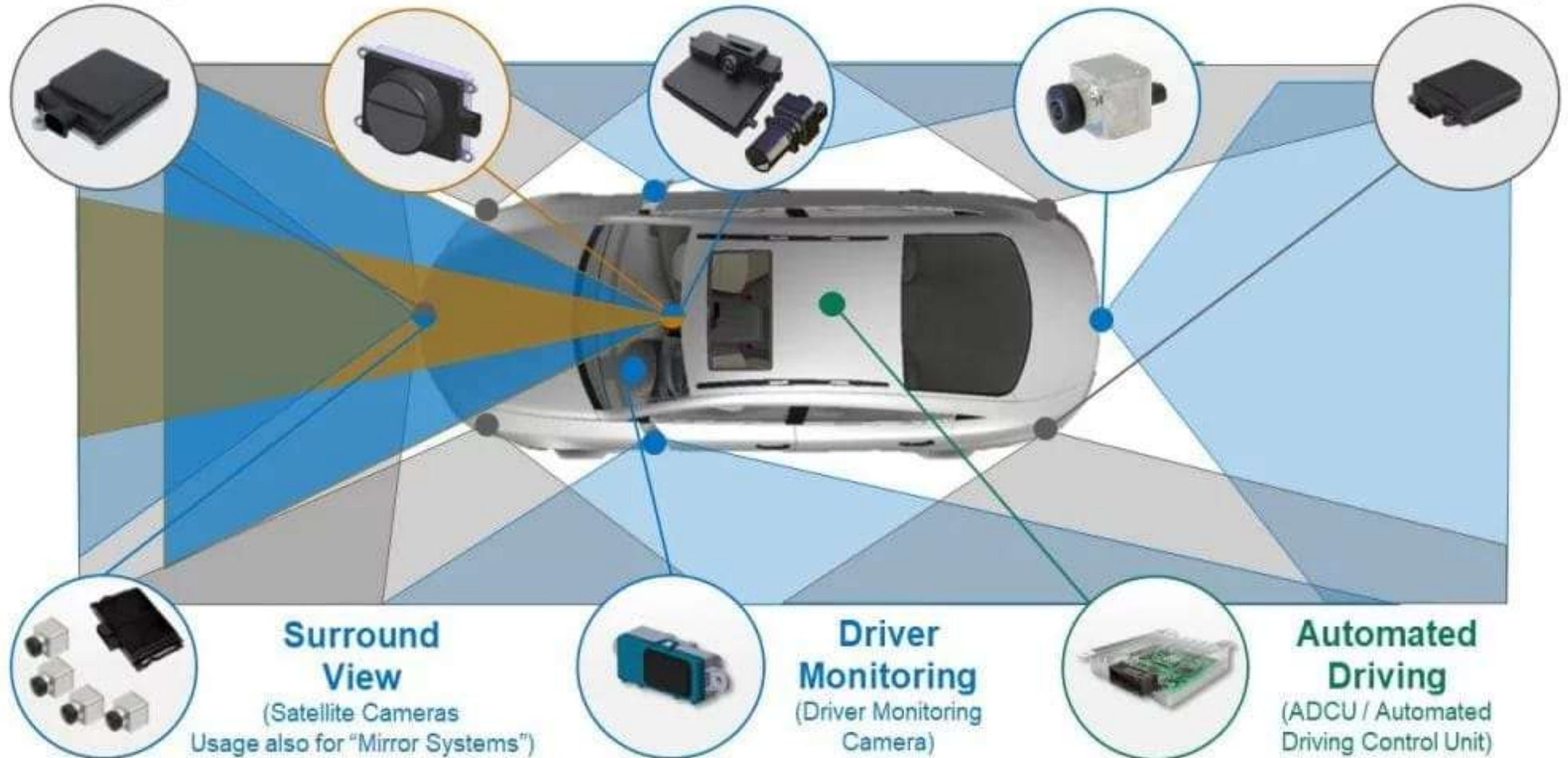❖ Automatic Road feature from high Resolution satellite image is required to detect the road network in a robust area.

Radar
(ARS Long Range Radar Sensor)

Lidar
(High Flash Lidar)

Front Camera
(Smart or Satellite)

Rear view camera
(Satellite Camera)

Radar
(SRR Short Range Radar Sensor)

Surround View
(Satellite Cameras Usage also for "Mirror Systems")

Driver Monitoring
(Driver Monitoring Camera)

Automated Driving
(ADCU / Automated Driving Control Unit)

METHOD: IMAGE TRANSLATION

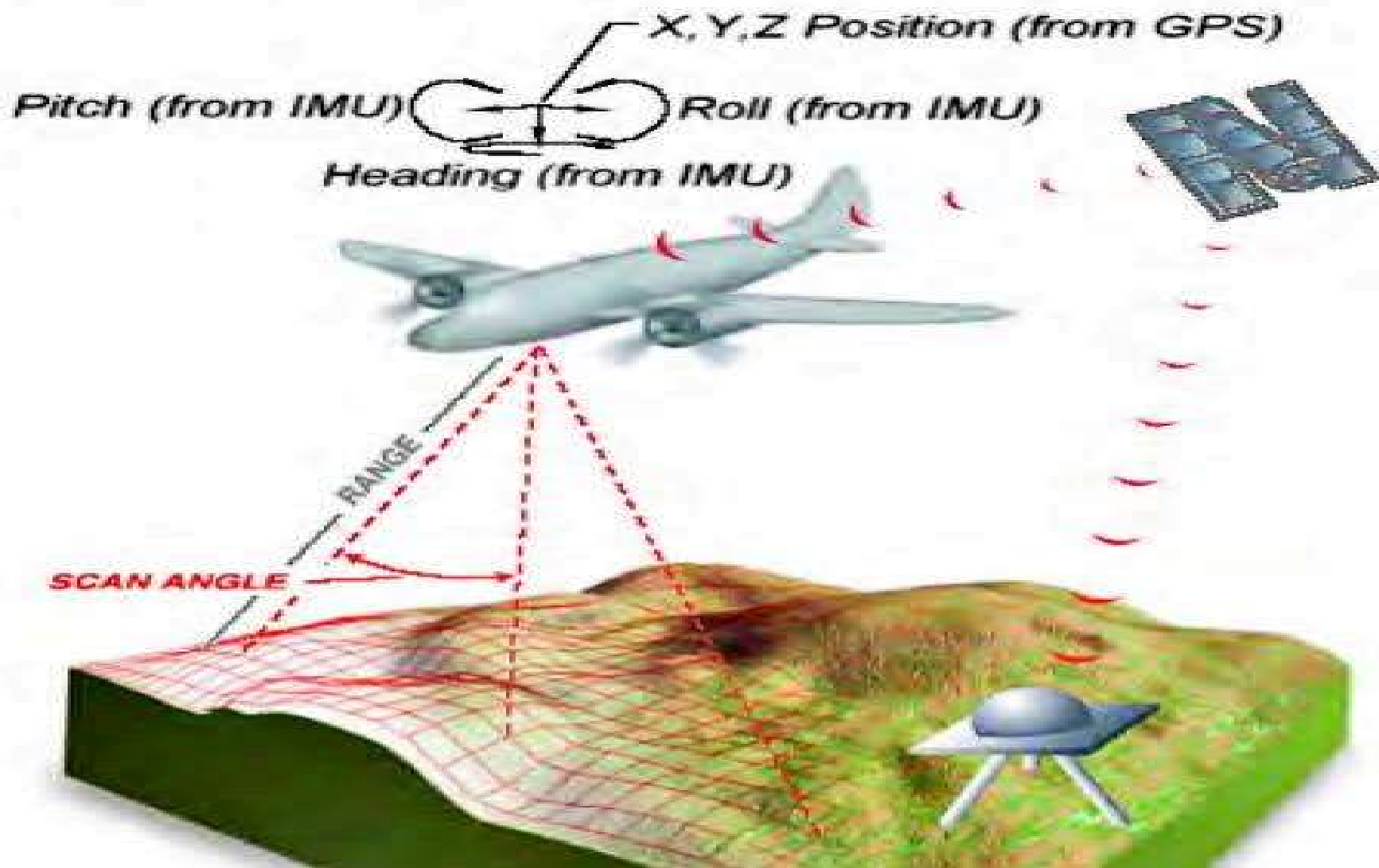**Pix2Pix. Generative conditional model**
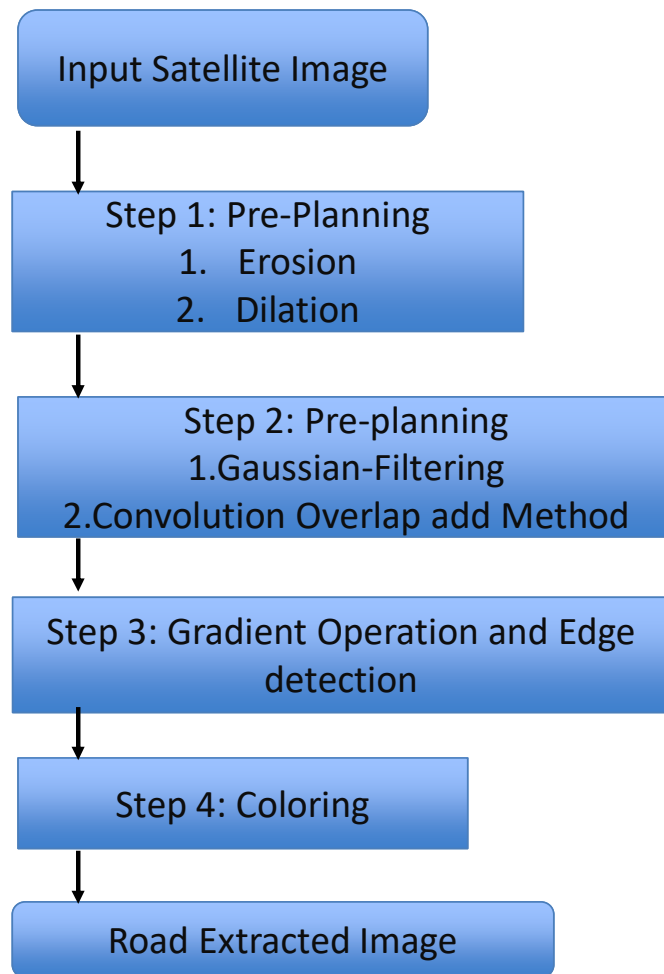
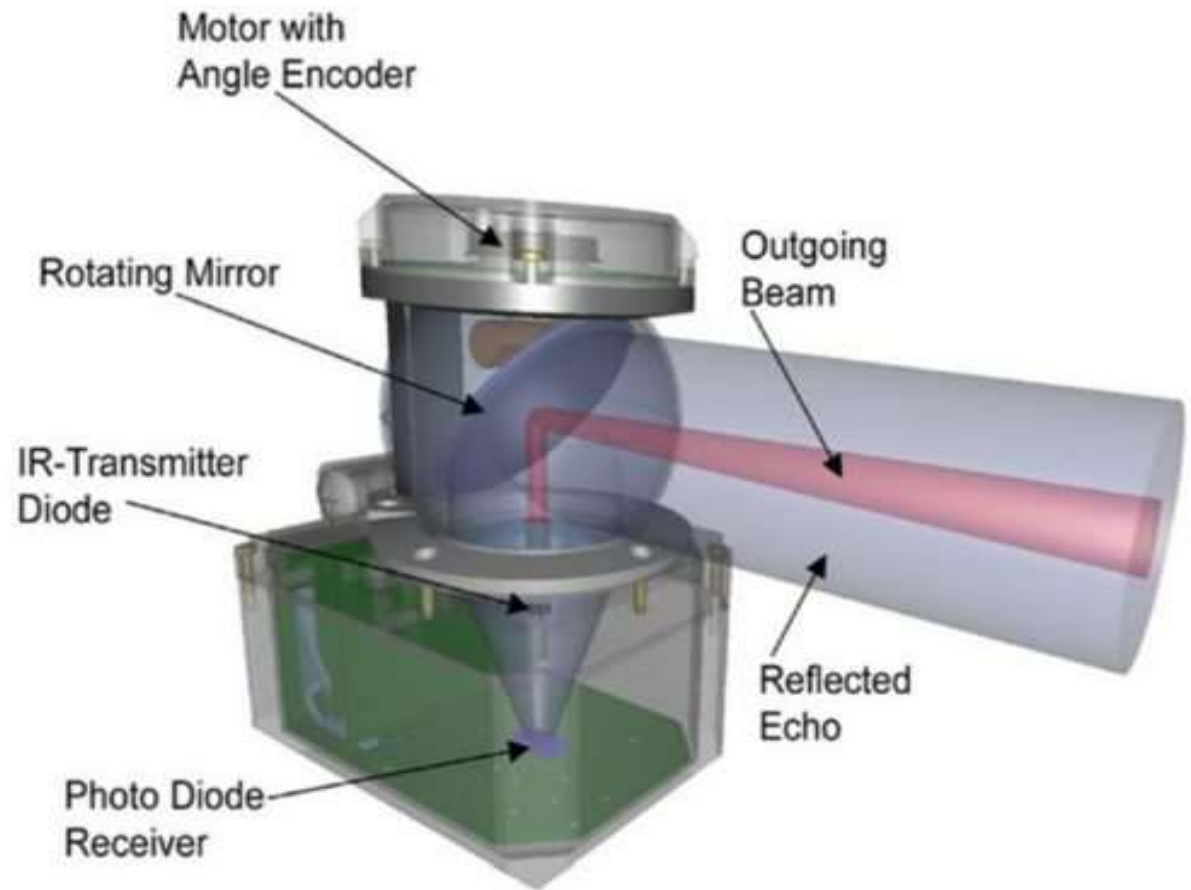Latent space 1, Source images $\longrightarrow$ Latent space 2, Target images

TECHNICAL APPROACH

❖ One of the technologies used in Automatic Road Detection is LiDAR(Light Detection and Ranging)

❖ LiDAR is an active sensing technique that uses light pulses to record a point cloud.

❖ For each point accurate 3d coordinates among other information are provided like elevation information help to identify roads

❖ Some other Technical approaches are Remote Sensing, Computer Vision, Image Processing, Data Fusion, Object-Based Image Analysis(OBIA), Artificial Intelligence(AI).

❖ LiDAR consists of Laser, Scanner, Receiver, GPS, Processor, Power Supply.

❖ ARDUINO is the open source prototyping platform which enables us the access of this technology.

❖ Code written in ARDUINO will execute its operation.

X,Y,Z Position (from GPS)

Pitch (from IMU)   Roll (from IMU)

Heading (from IMU)

RANGE

SCAN ANGLE

```
Input Satellite Image

        ↓

Step 1: Pre-Planning
    1. Erosion
    2. Dilation

        ↓

Step 2: Pre-planning
1.Gaussian-Filtering
2.Convolution Overlap add Method

        ↓

Step 3: Gradient Operation and Edge
detection

        ↓

Step 4: Coloring

        ↓

Road Extracted Image
```

One more method to deal it is A **COLLISION AVOIDANCE SYSTEM** (CAS) is a safety feature designed to prevent or mitigate collision between vehicles, pedestrians, or obstacles.

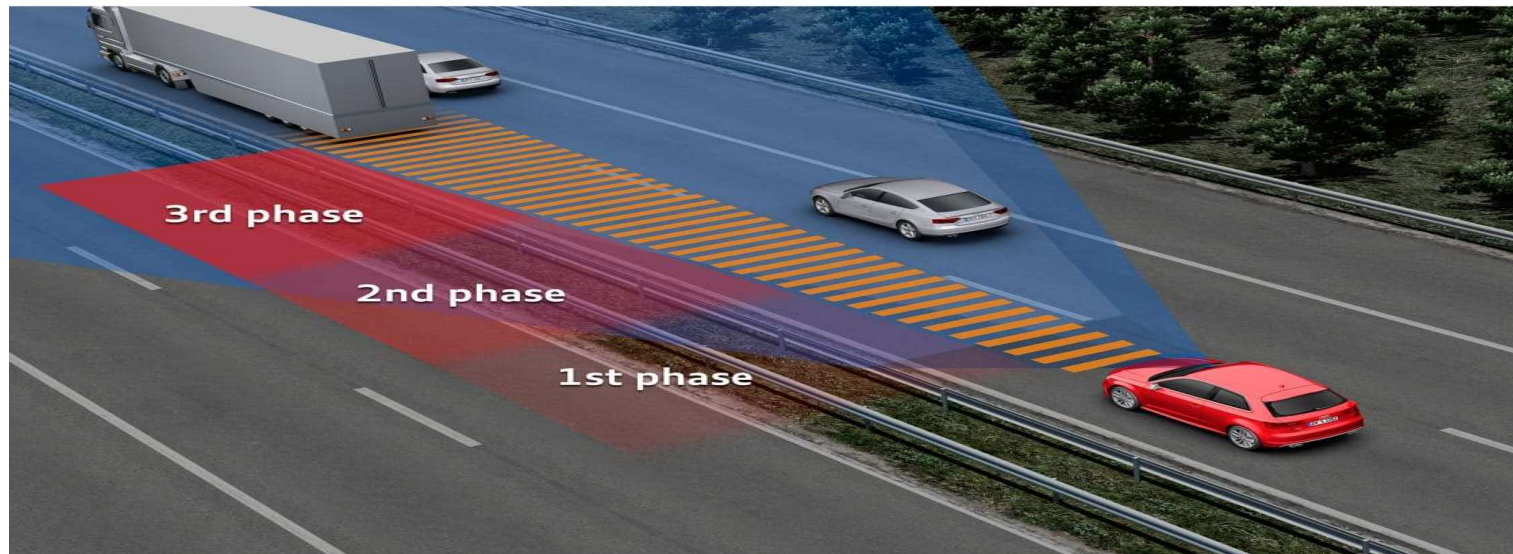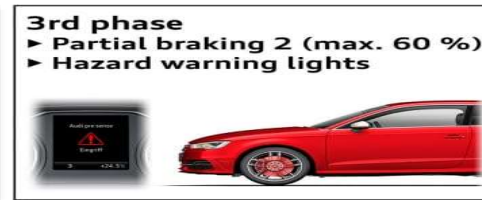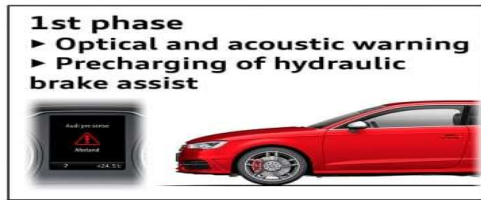It also contains sensors, software, Alert system, Driver Monitoring.

Motor with Angle Encoder

Rotating Mirror

IR-Transmitter Diode

Outgoing Beam

Reflected Echo

Photo Diode Receiver

Components of LiDAR

IMPACT AND BENEFITS

❖ Some of its Benefits are that It improves Navigation and Routing, Enhance Urban Planning, Disaster Response and Recovery, Environmental Monitoring, Infrastructure Safety, Land Use Planning, Research & Analysis.

❖ To overcome these challenges there are two types of extraction and can be classified into two types such as semi-automatic and fully automatic.

❖ Image obtained from satellite are useful in much environment application such as tracking of Earth resources, Geographical mapping, and production of agricultural crops, urban growth, weather, flood and fire control are some of its potentials

❖ The major challenges of Road Extraction method is the complex structure and texture of the images, which contain many different objects such as Roads, Houses, Trees, Vehicles etc., with differences in shape, tone

1st phase
► Optical and acoustic warning
► Precharging of hydraulic brake assist

2nd phase
► Warning jolt
► Partial braking 1 (max. 35 %)

3rd phase
► Partial braking 2 (max. 60 %)
► Hazard warning lights

3rd phase
2nd phase
1st phase

Collision avoidance system is the system used to reduce fatal accidents by immediate breaking systems

RESEARCH AND ANALYSIS

➢ In order to evaluate the functionality of the Road Extraction Method proposed in this research two sub samples of pan-sharpened Quick Birds and IKONOS images from Bushehr Harbour and Kish islands in Iran were used as case study. Manually produced reference image applied in accuracy assessment procedure
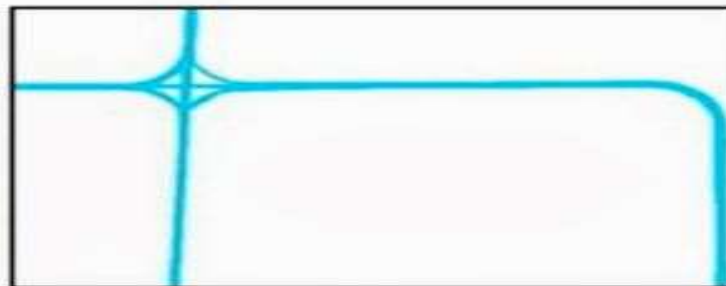
a
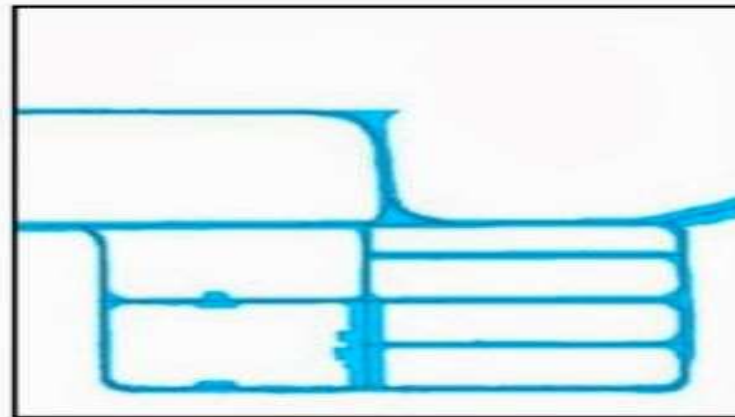
b

Figure 6. Pan-sharpened Quick Bird image of Bushehr harbor
and its manually produced reference image

a

b

Figure 7. Pan-sharpened IKONOS image of Kish Island and its
manually produced reference image

THE
END