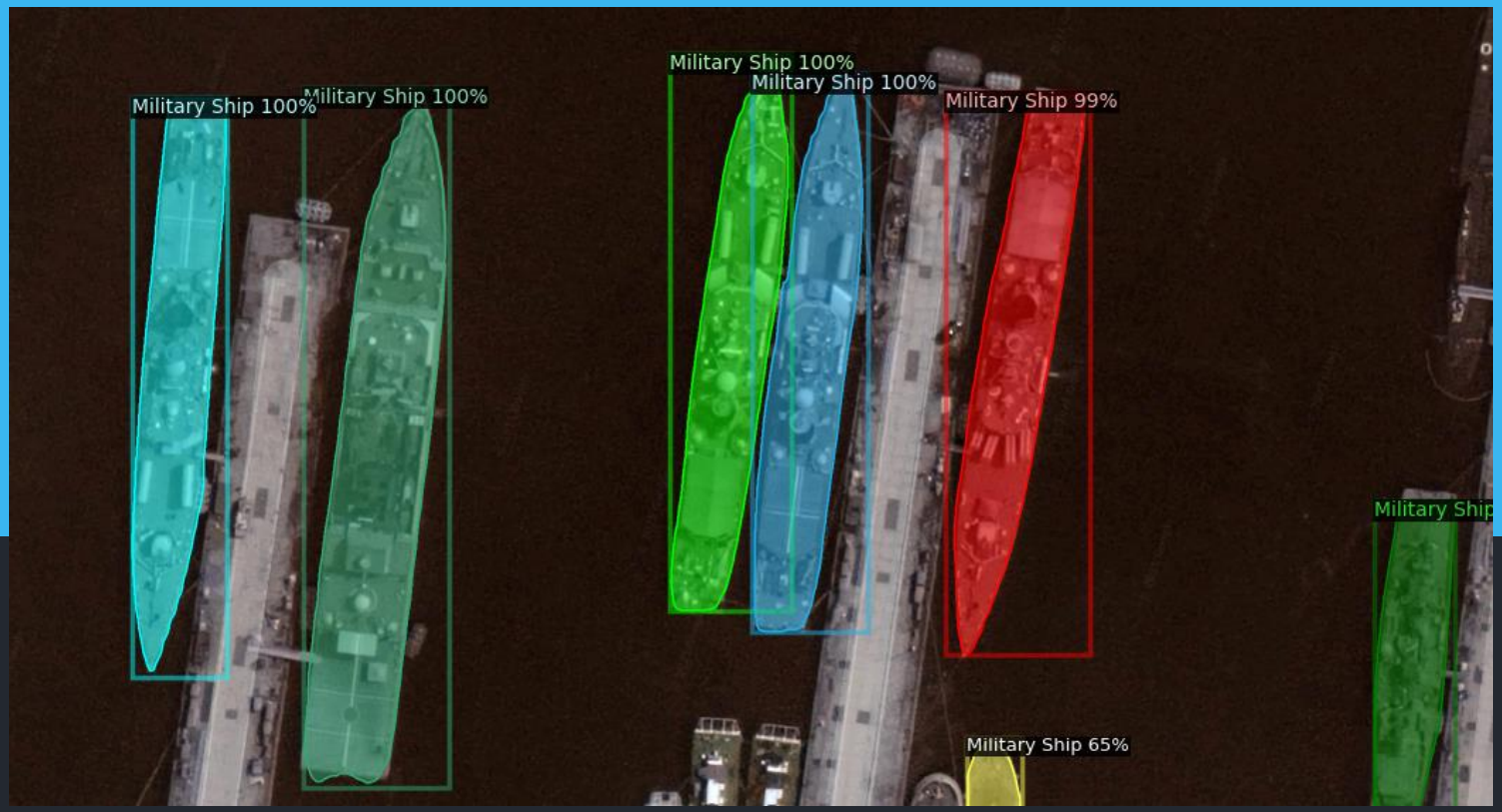
Artificial Intelligence based Maritime Target Detection and Identification System for Aerial Imaging (AIM-DISA)



Presented by-
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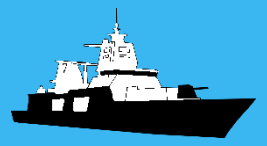
Lieutenant
ALO, INS Shakti

Introduction

01



Indian Navy

Safety & security of maritime interest of country.

02

Early detection

Effective utilisation of available resources.

03

Surveillance

- Satellite
- UAV
- Patrolling (Aircraft, Ship)

04

Sensors

- Transmission for detection
- Passive (only reception)

Problem Statement

Active transmission using Radar

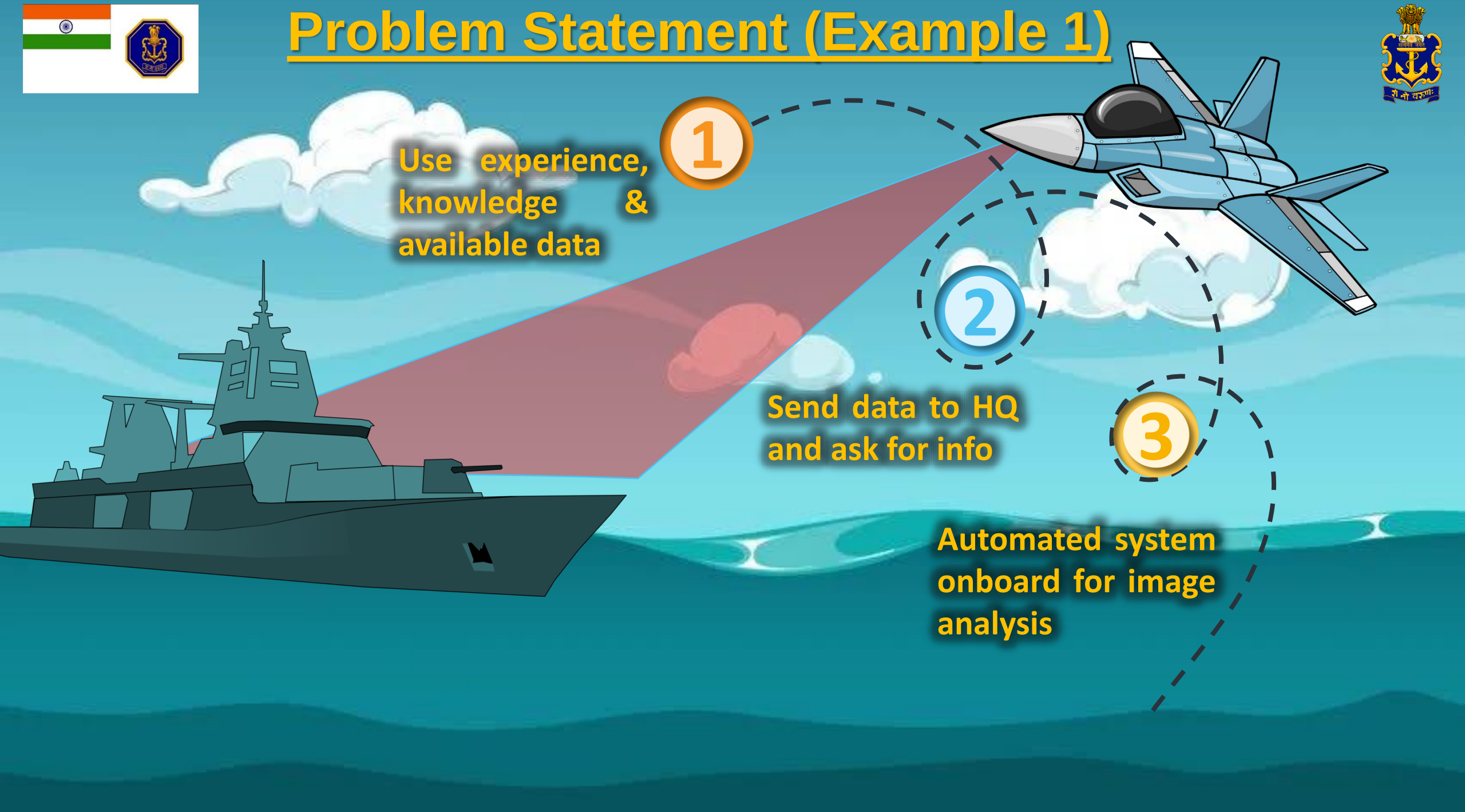
Big data analysis

Patroling of area during hostile situation

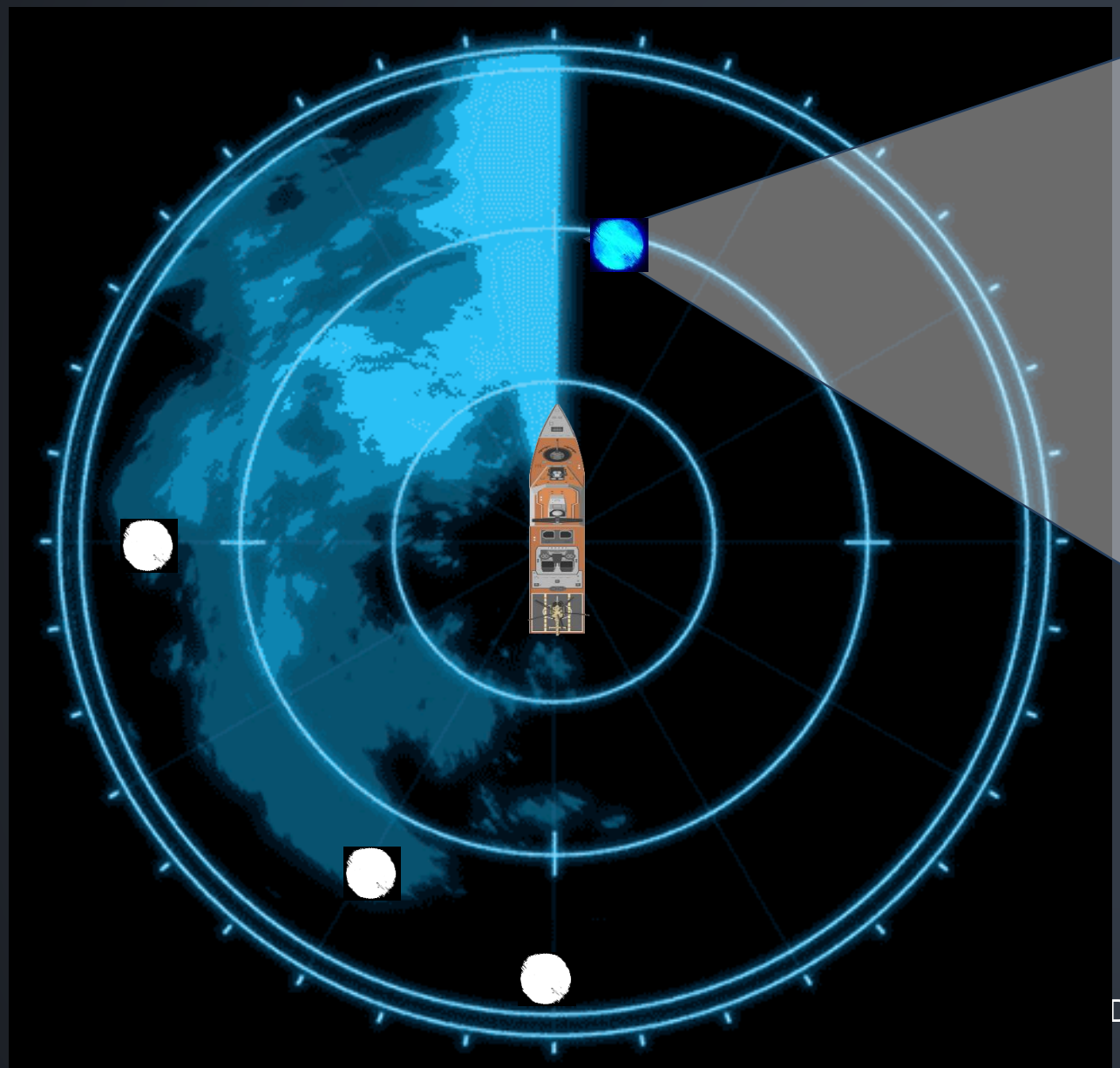
Data analysis & time

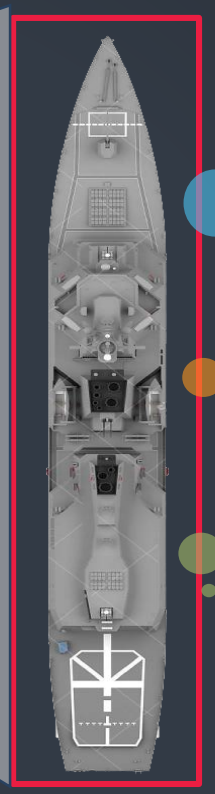
Information from data

Problem Statement (Example 1)



Problem Statement (Example 2)





Go through Janes book data, manually.

Check on RT or send data to HQ.

A PC based automated system interfaced with onboard long range camera

Proposed System

DETECT

Presence boat/ ship like object in the input image/ video.

CLASSIFY

Detected target is military vessel or civil vessel.

IDENTIFY

Detected target (Military vessel) is a Indian Naval Ship.
Type – Frigate
Class – P-17

System Output

Country of origin, type and class of ship

All the ships in that class (fleet ship data)

Fitted armament, radar, ASW complex, decoy & counter measures

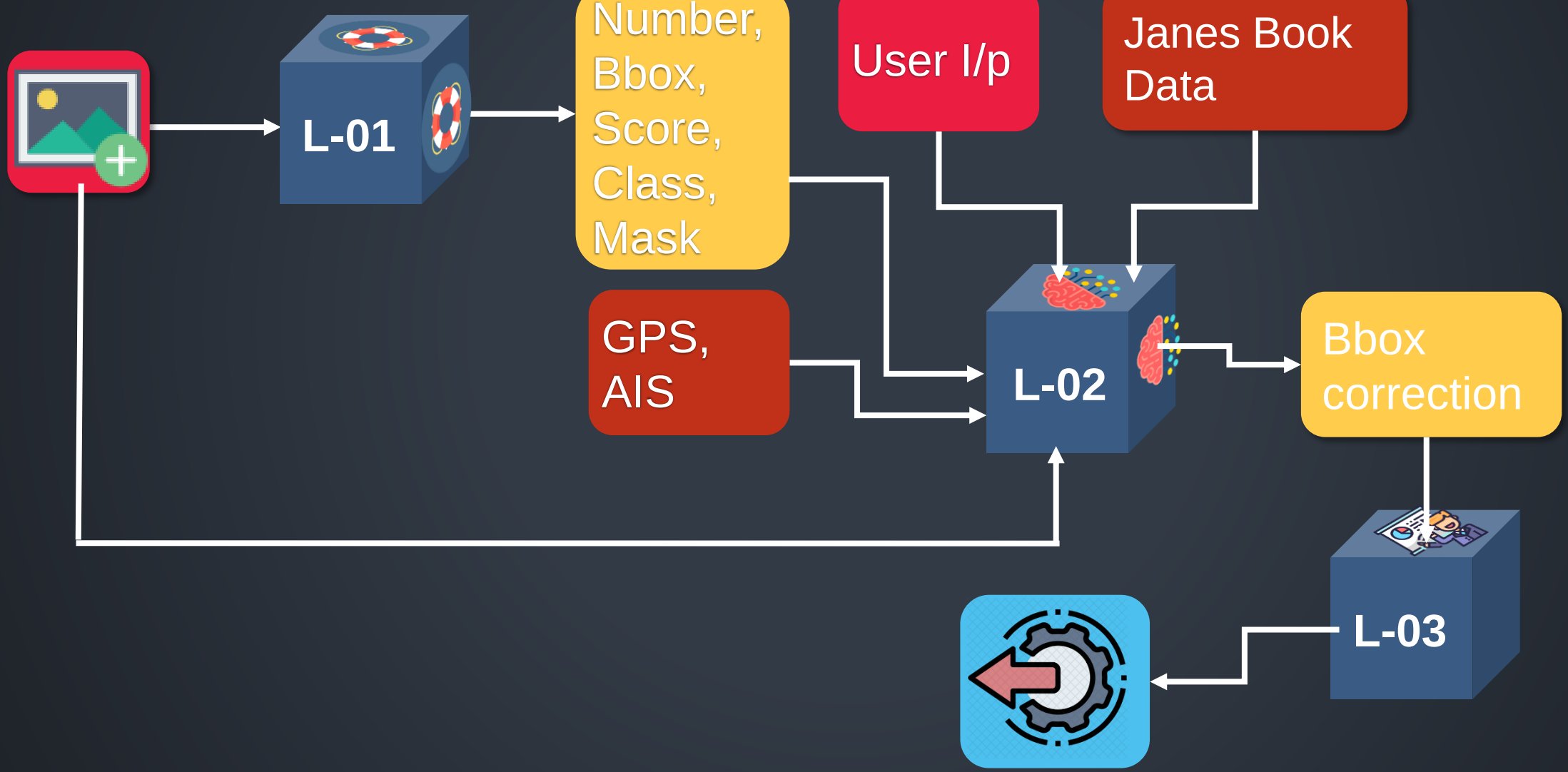
Target location, Heading, bearing & range

Own location & heading

Type of vessel (civil / military)

AIS data, if available

Working of the system



Results

```
Processing....
predictin done....
Visualization prediction done....
Accuracy, class and score calculation done....
Mask calculation processing....
on 1200000: Processing for object Done.... 1 out of .... 3

|                                                ✗ ▄▄▄ 2137496/3600
on 2400000: Processing for object Done.... 2 out of .... 3
on 3600000: Processing for object Done.... 3 out of .... 3
on 3600000: Detected Object: 0 0.99747485
on 3600000: Detected Object: 1 0.9764206
on 3600000: Detected Object: 0 0.953599
|                                                ✗ (!) 3600000/3600
|                                                | 100/100 [100%] i
```

Results – Target Classification

Results

Terminal

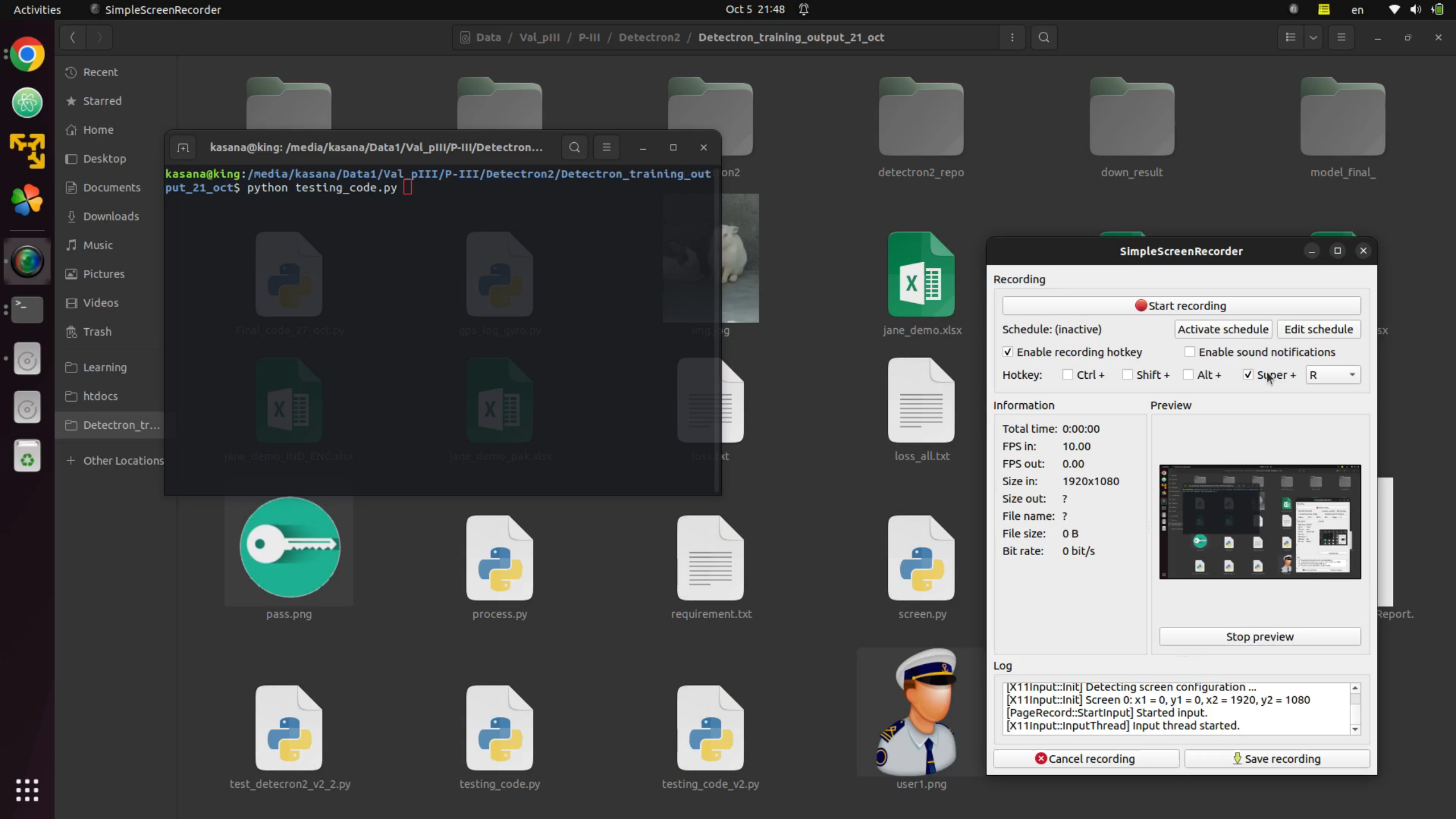
kasana@king: /media/kasan

S.No.	Type of Weapon	Class	Name
1	Missle	SSM	8 Novator 3M-54TE Club-N (SS-N-27A Sizzler) ; anti-ship; inertial guidance and active radar terminal homing to 220 km (118.8 n miles) at Mach 0.8 (cruise) and Mach 2.9 (attack); warhead 200 kg; sea-skimmer.
2		SAM	3K-90E/M-22 Shtil (SA-N-7 Grizzly); single launcher]; 24 9M38M1 missiles; inertial guidance with command updates and semi-active radar terminal homing to 29.6 km (16.0 n miles) at Mach 3; altitude 30-14,000 m (98-45,932 ft); warhead 70 kg. 4 octuple VLS for 32 IAI Barak-1; comm and line of sight radar or optical guidance to 12 km (6.5 n miles) at Mach 2; warhead 22 kg.
3	Gun	MR/CR	(a) 1 Oto Melara 76 mm/62 Super Rapid (b) AK-630M 30 mm/65
5	Anti submarine	Torpedo/Mortars	4-533 mm DTA-53-956 (2 double)
6	ESM	ESM	Ellora EW suite.

Jun 26 18:20

7	Decoy system	for ai r/u nde rwa ter	4 Kavach chaff launchers.
9	SONAR	SONAR	BEL HUMSA; hull-mounted; active search and attack; medium frequency
10	CMS		BEL CMS-17. Electro-optic
11	Helo		1 Sea King Mk 42B

S.No.	Type of Radar	Name
1	Air surveillance Radar	Elta EL/M-2238 AMDR-ER; 3D; E/F-band
2	Air surveillance Radar	
3	Surface surveillance Radar	2 BEL Rashmi; I-band
4	Surface surveillance Radar	
5	Navigation Radar	
6	Fire control Radar	
7	Fire control Radar	


Activities
SimpleScreenRecorder
Oct 5 21:48
en
Data / Val_pIII / P-III / Detectron2 / Detectron_training_output_21_oct
Recent
Starred
Home
Desktop
Documents
Downloads
Music
Pictures
Videos
Trash
Learning
htdocs
Detectron_tr...
Other Locations
kasana@king: /media/kasana/Data1/Val_pIII/P-III/Detectron...
kasana@king:/media/kasana/Data1/Val_pIII/P-III/Detectron2/Detectron_training_output_21_oct$ python testing_code.py
detectron2_repo
down_result
model_final_
jane_demo.xlsx
loss_all.txt
pass.png
process.py
requirement.txt
screen.py
test_detectron2_v2_2.py
testing_code.py
testing_code_v2.py
user1.png
SimpleScreenRecorder
Recording
Start recording
Schedule: (inactive)
Activate schedule
Edit schedule
Enable recording hotkey
Enable sound notifications
Hotkey:
Ctrl +
Shift +
Alt +
Super +
R
Information
Total time: 0:00:00
FPS in: 10.00
FPS out: 0.00
Size in: 1920x1080
Size out: ?
File name: ?
File size: 0 B
Bit rate: 0 bit/s
Preview
Stop preview
Log
[X11Input::Init] Detecting screen configuration ...
[X11Input::Init] Screen 0: x1 = 0, y1 = 0, x2 = 1920, y2 = 1080
[PageRecord::StartInput] Started input.
[X11Input::InputThread] Input thread started.
Cancel recording
Save recording

Result - Testing

Processing time – upto 05 target (PC without GPU)

Classification Accuracy

Detection Accuracy

96/ 106 – at threshold of 85 %
101/ 106 – at threshold of 60 %

Applications

Safety and security of internal water

Port scanning – using satellite optical images

Surveillance data analysis

Monitoring fishing and supecious activities

Search & Rescue (SAR)

Inceased situational awareness

Future Application

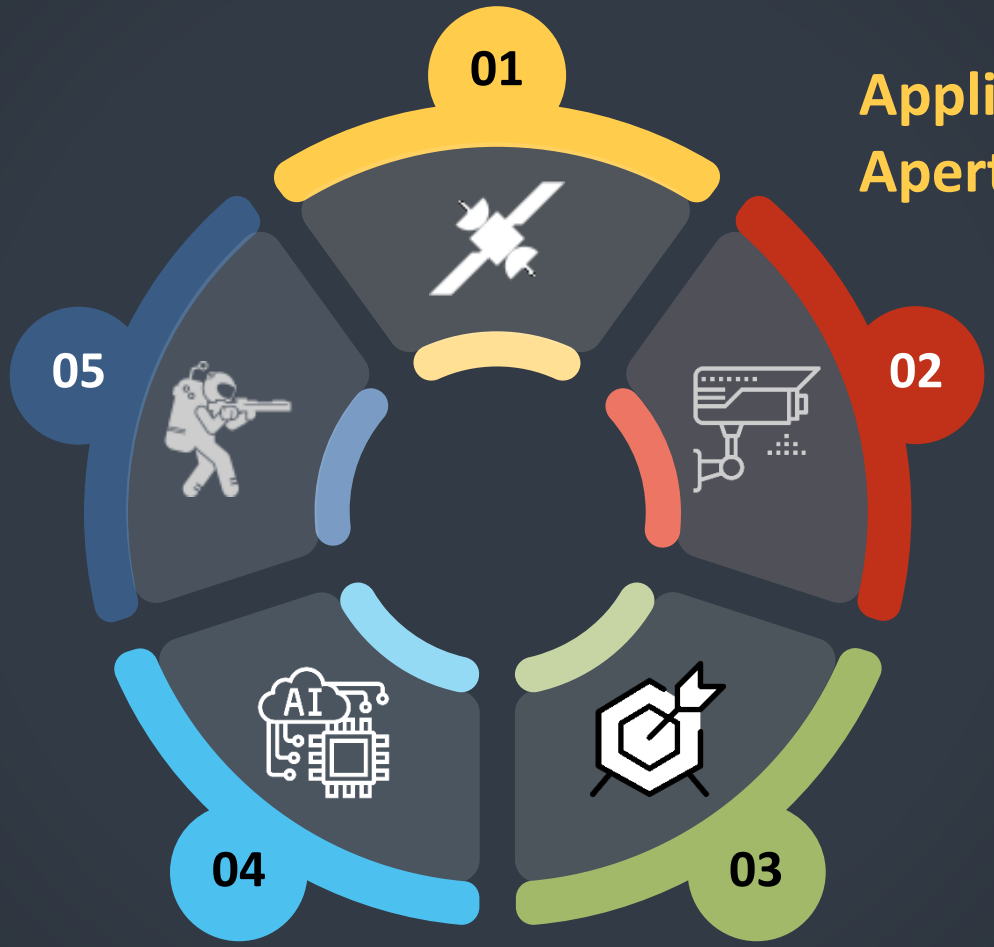
01 Application with Synthetic Aperture Radar (SAR)

02 Integration with Ship & submarine borne cameras

03 Target classification with Silhouette Image

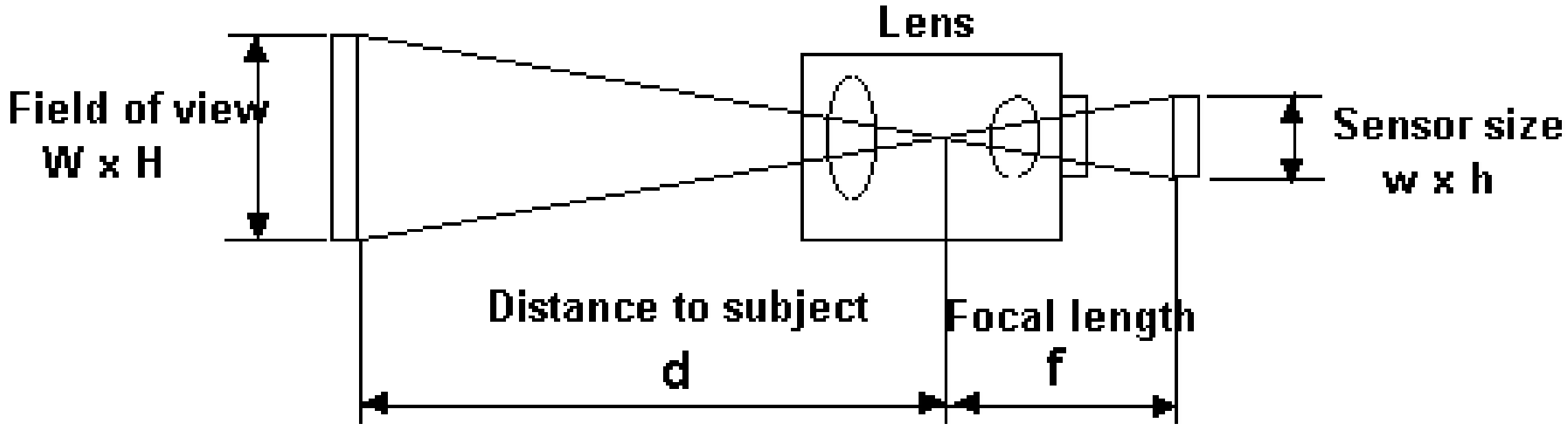
04 Integration with CMS & MDA

05 Application beyond Maritime domain



Discussion

Additional



$$\frac{w}{W} = \frac{h}{H} = \frac{f}{d}$$

Additional


Location : Visakhapatnam, India
Indian Nuclear Submarines
INS Chakra
Russian K-152 Nerpa (leased)
INS Arihant/S2/SSBN-80
Indigenious built
Image Courtesy : Google Earth
Note the floating canopy cover to prevent Satellite Detection

Additional

Aladfar INT 🇵🇰
@weunsullied

INS #Arihant out at sea as shown in the latest imagery.

#IndianNavy
#OSINT

5:44 pm · 24 Jul 20 · TweetDeck

Viper
@viper202020

A rare glimpse of 2 nuclear submarines of Indian Navy pictured together. SSBN INS Arihant and SSN INS Chakra (Akula Class).

PS/- This photo is a few years old
#IndiaChinaStandoff
#IndiaChinaFaceOff
#osint

12:02 pm · 19 Oct 20 · Twitter Web App

Damien Symon
@detresfa_

#IndianNavy indigenous aircraft carrier #INSVikrant (IAC-1) spotted 100 nautical miles west of Kochi part of its ongoing phase-II sea trials

Thursday, October 28, 2021

10:00 am · 29 Oct 21 · Twitter Web App

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