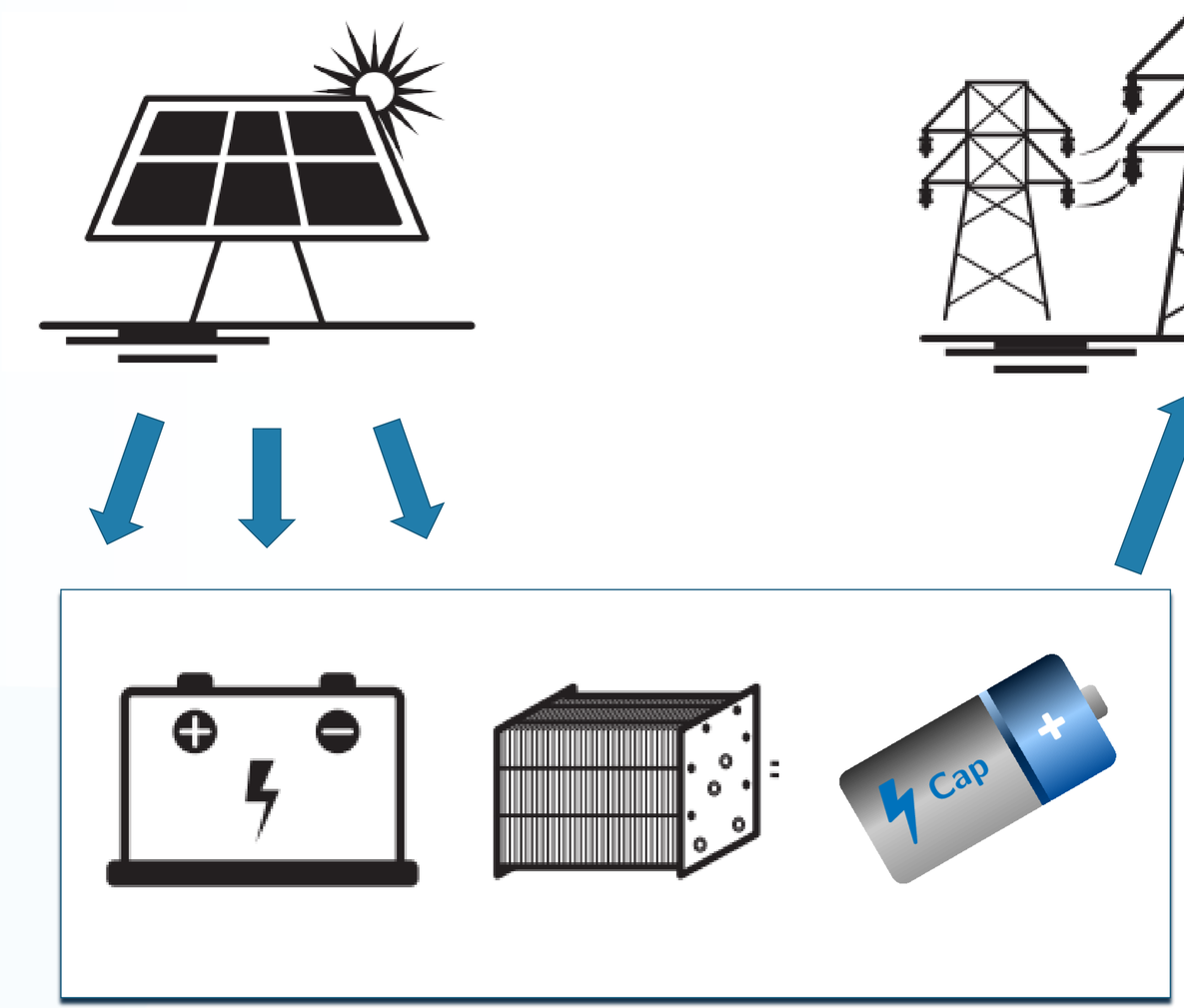
JavaCro'19

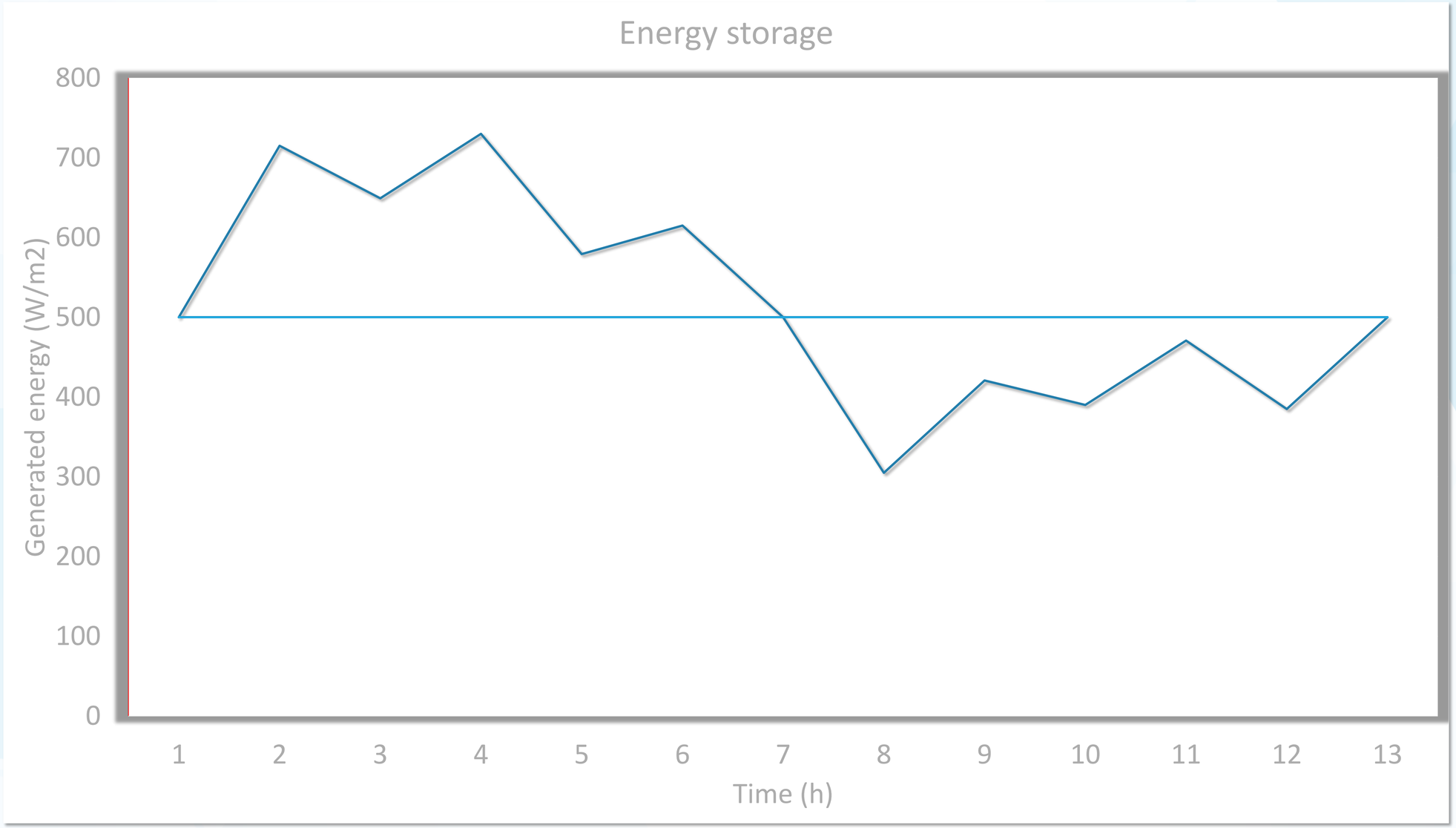
Controlling solar electric system using Java

Aleksander Radovan, HUJAK, King ICT, TVZ, VVG, RIT Croatia, Algebra
Branko Mihaljević, HUJAK, RIT Croatia

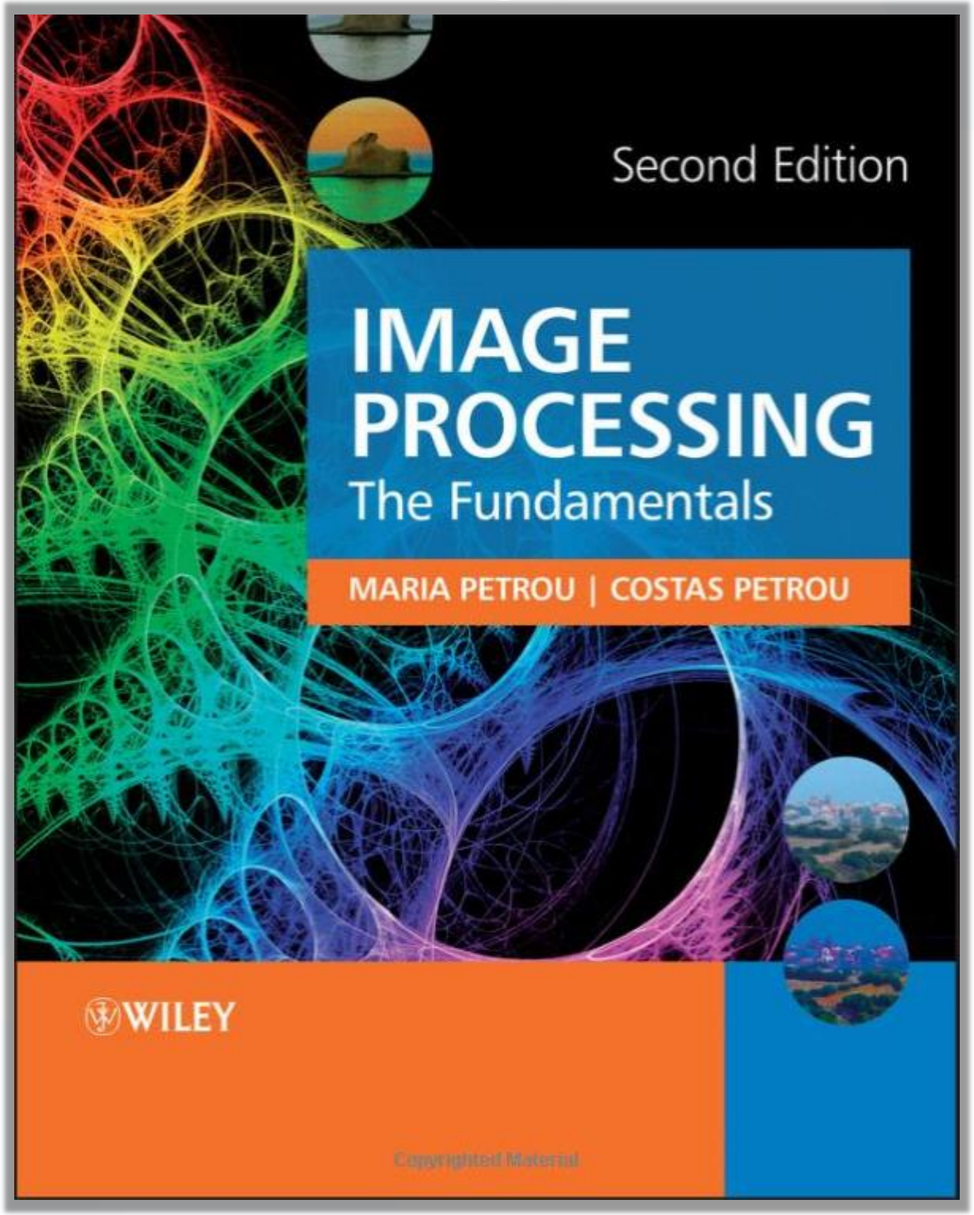
Basic concept



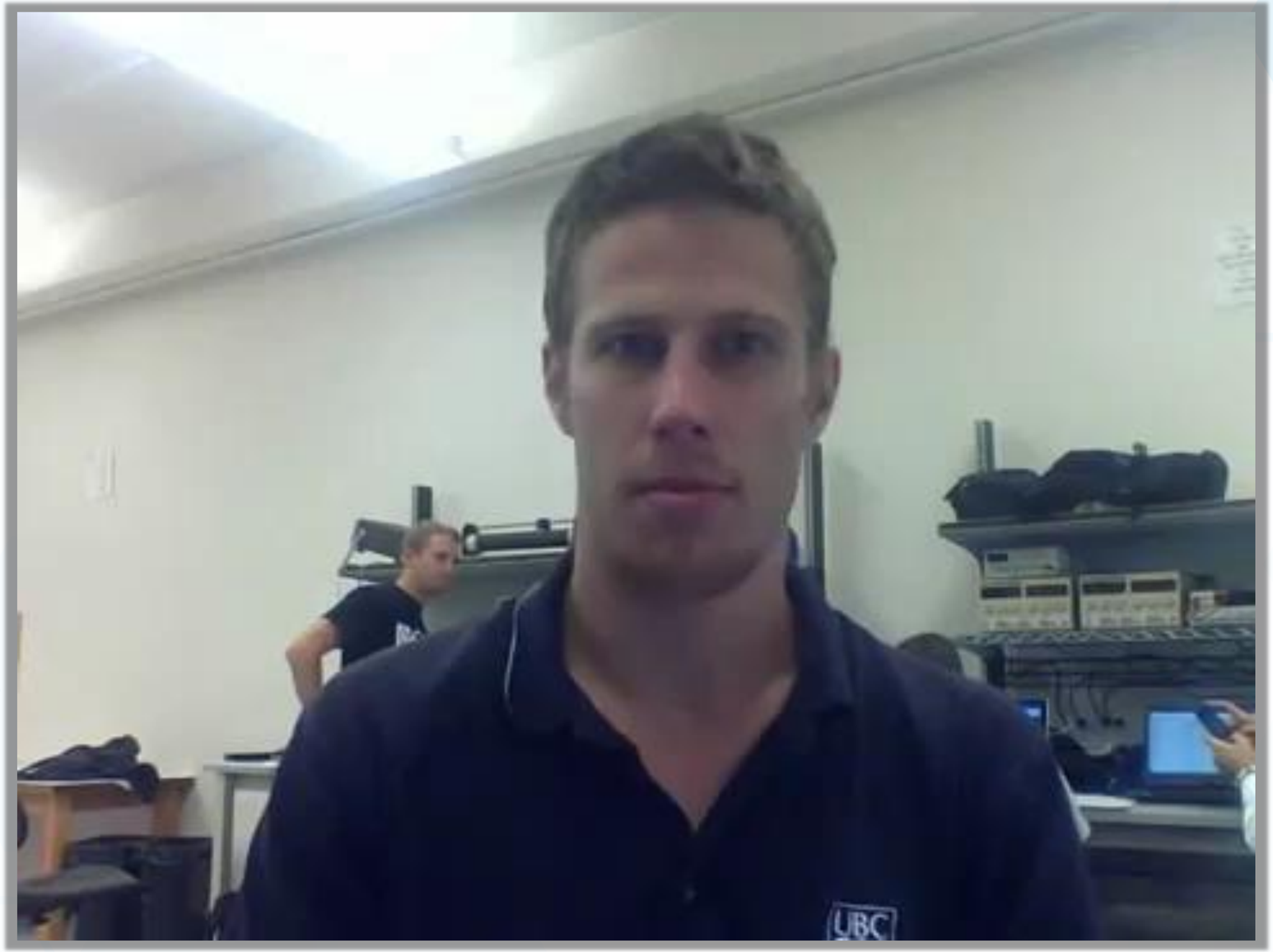
Problem


Energy storage
Generated energy (W/m2)
800
700
600
500
400
300
200
100
0
1
2
3
4
5
6
7
8
9
10
11
12
13
Time (h)

Starting point



The idea



PREDICTING THE MOMENT WHEN THE CLOUD COVERS THE SUN

01

DETECT THE CLOUD EDGES

02

DETERMINE THE SPEED AND MOVE DIRECTION

03

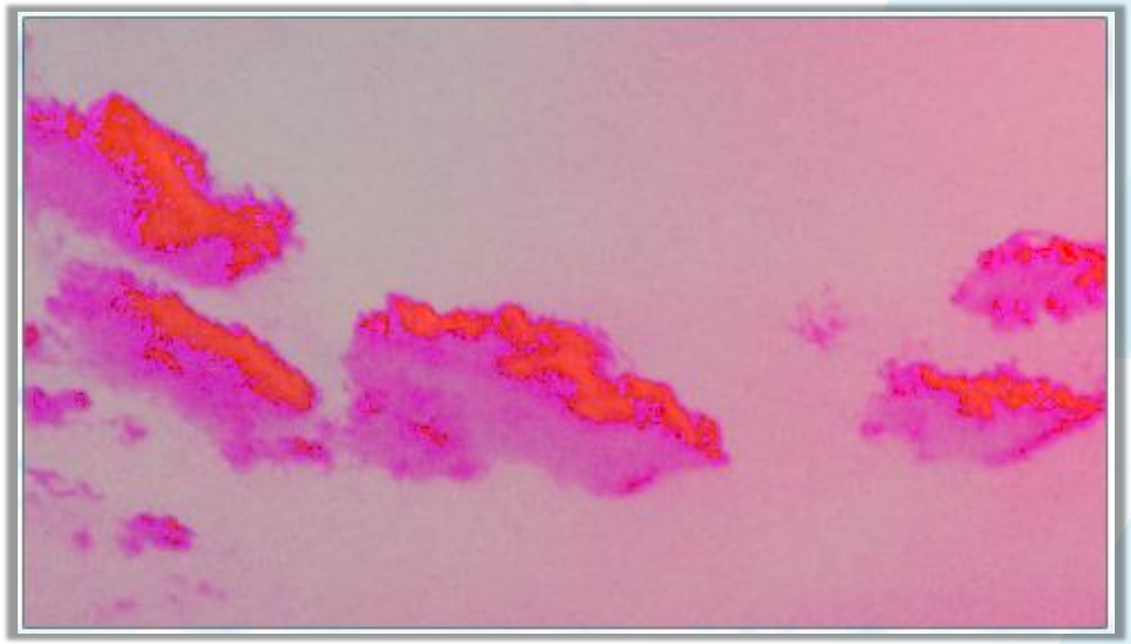
PREDICT THE MOMENT OF COVERING THE SUN

04

PREDICT THE LENGTH OF THE SHADOW

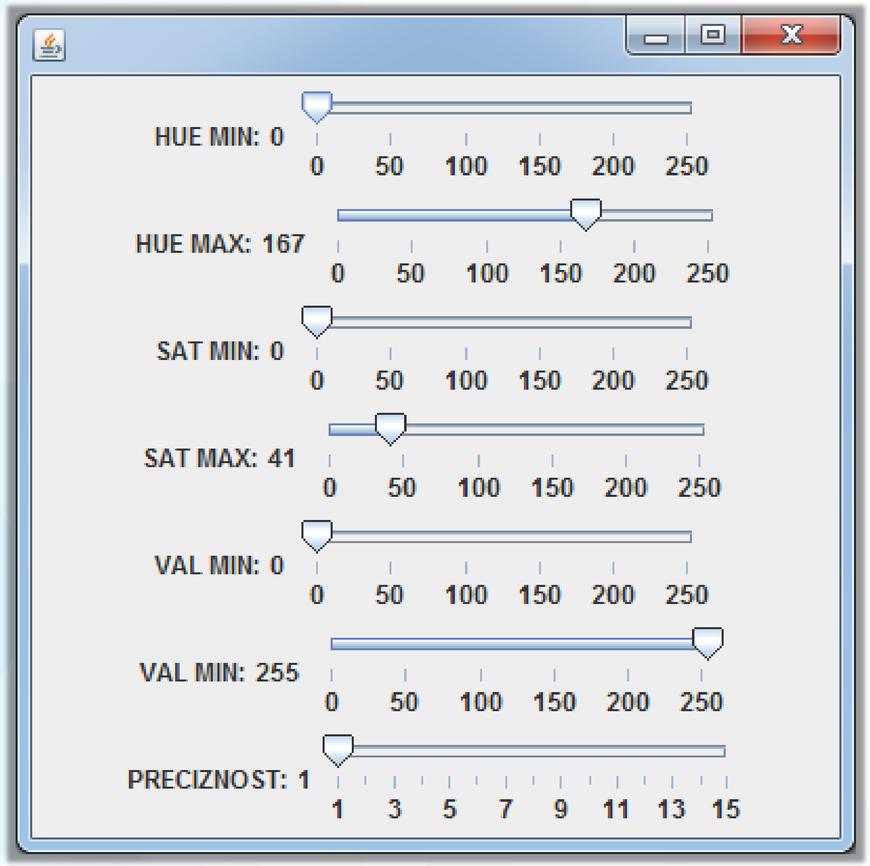
PHASE: DETECTING THE CLOUD EDGES

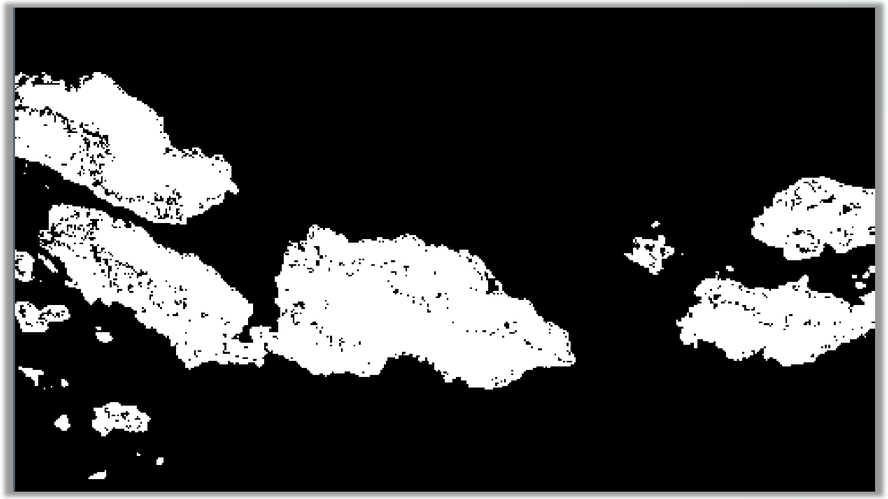
STEP 1: CONVERTING RGB -> HSV COLOR MODEL



PHASE: DETECTING THE CLOUD EDGES

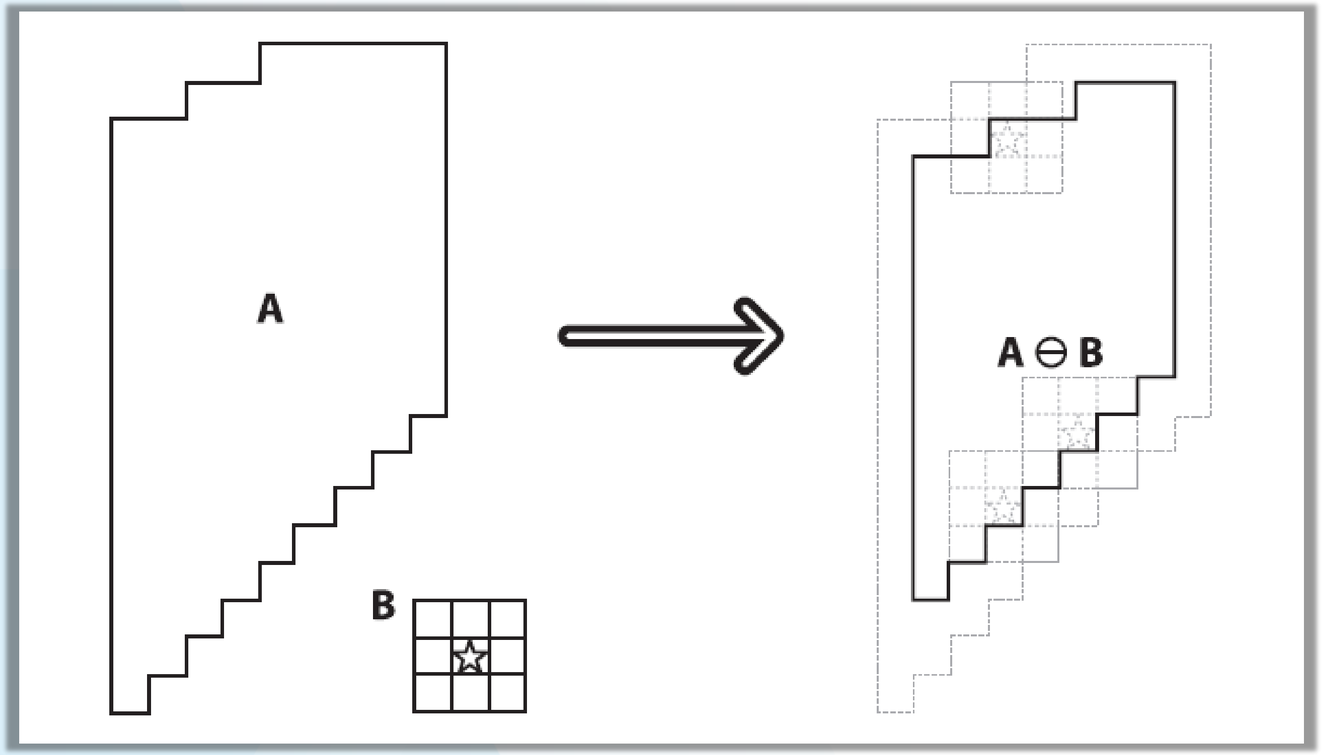
STEP 2: SETTING THE THRESHOLD



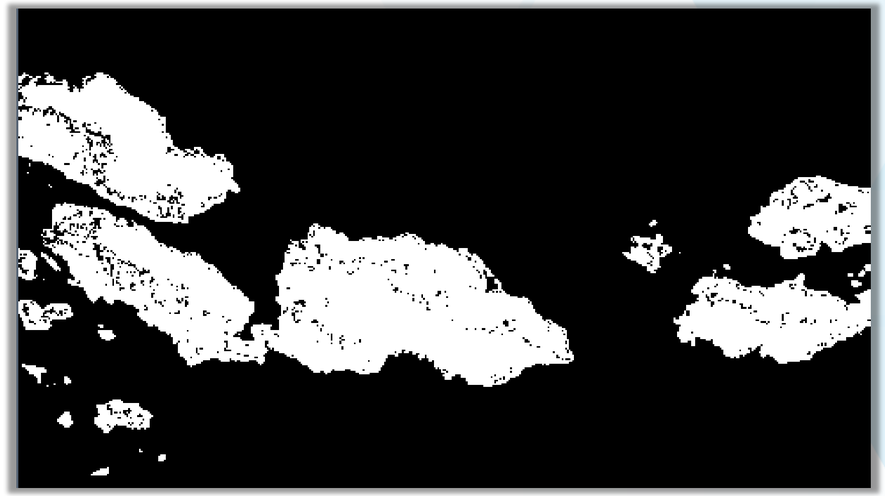


PHASE: DETECTING THE CLOUD EDGES

STEP 3: APPLYING EROSION

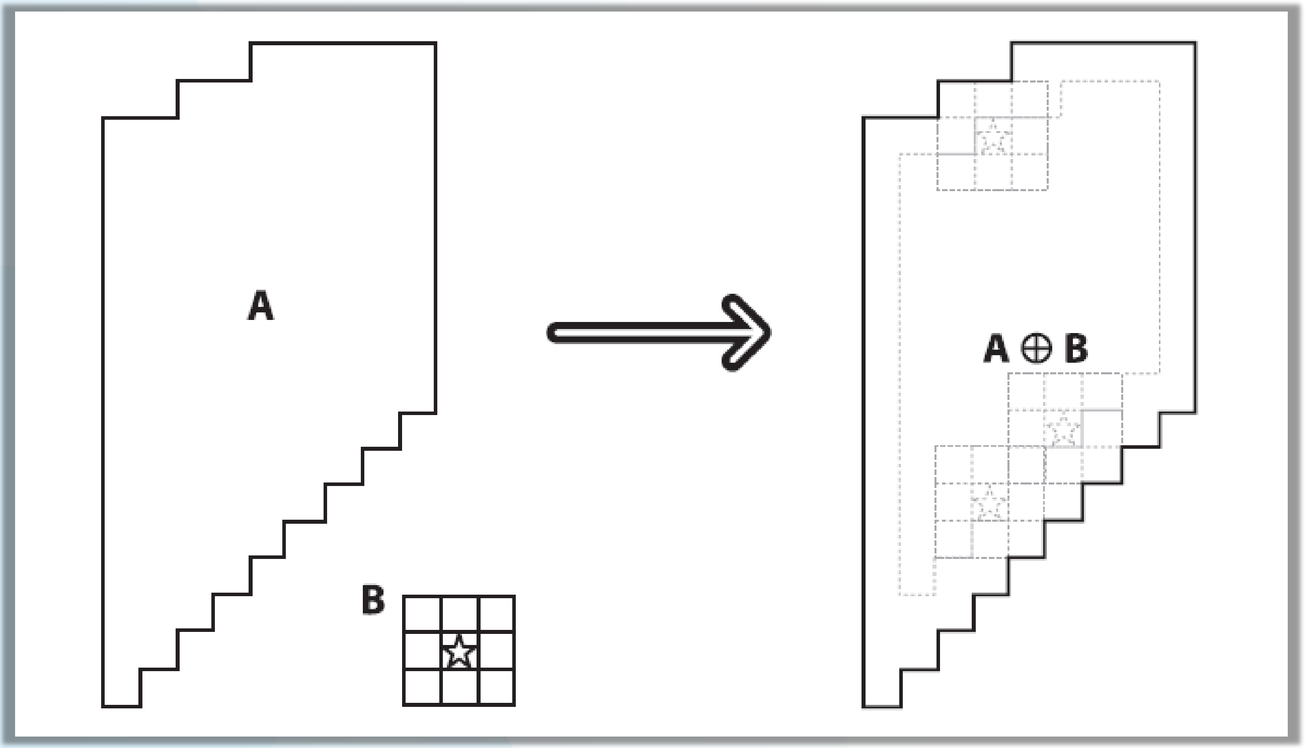


Source: Learning OpenCV, O'Reilly, p. 117

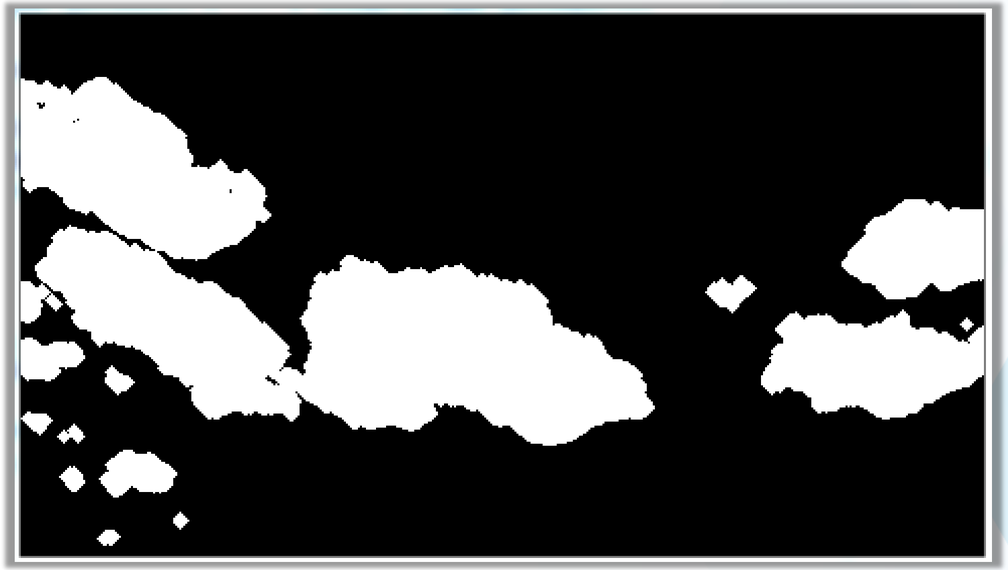


PHASE: DETECTING THE CLOUD EDGES

STEP 4: APPLYING DILATATION



Source: Learning OpenCV, O'Reilly, p. 116

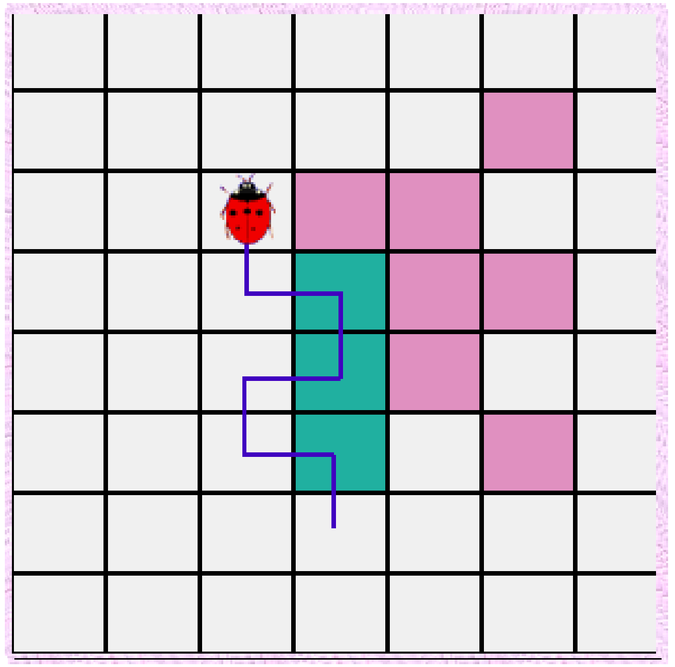


PHASE: DETECTING THE CLOUD EDGES

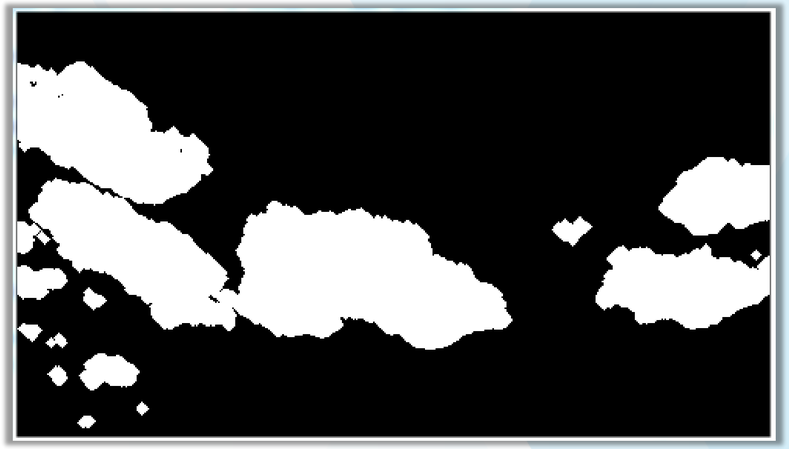
STEP 5: CONTOUR TRACKING

THE ALGORITHM

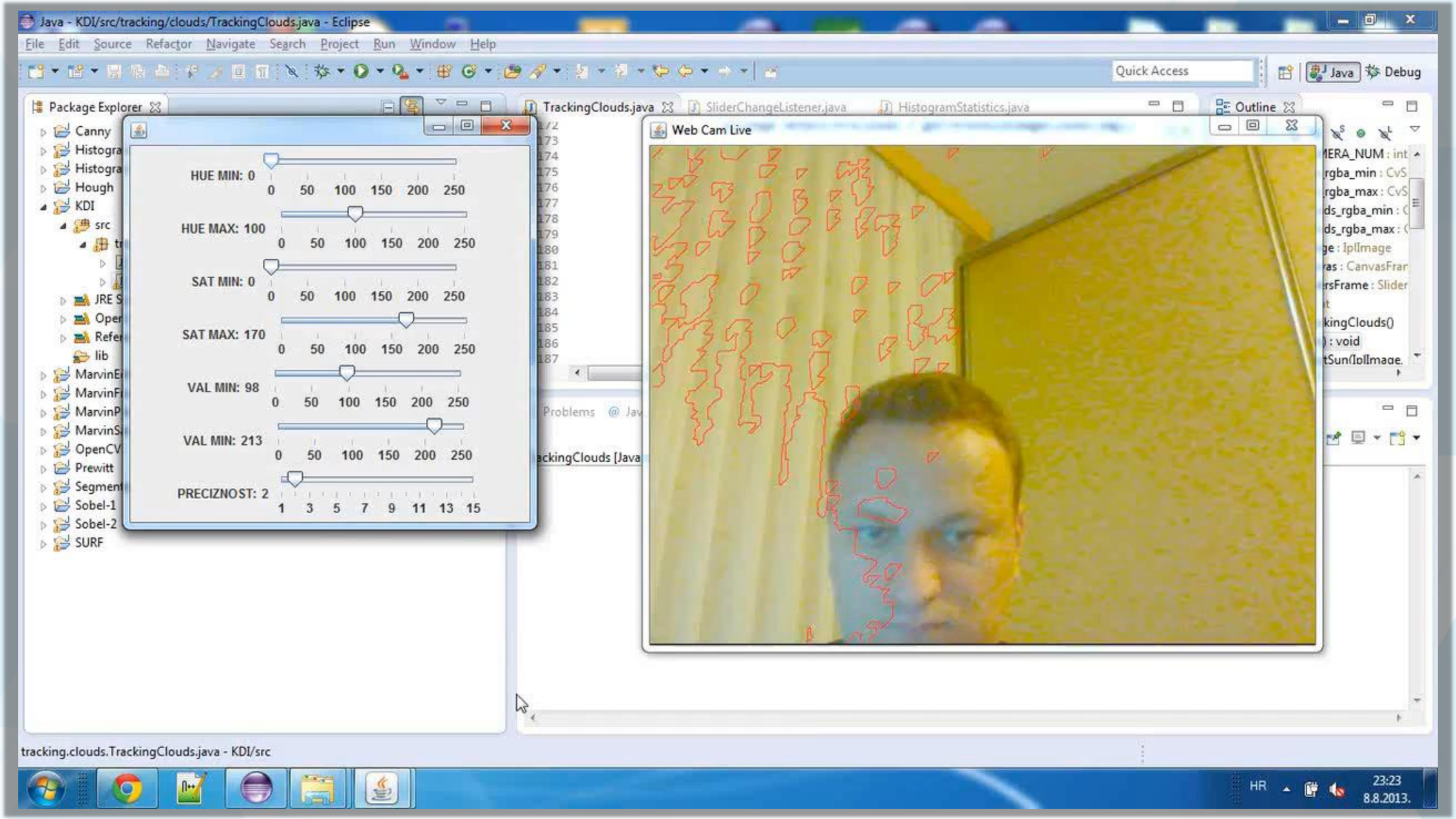
For every contour on the image
  Detect the starting pixel on the image
    Repeat until the return to the starting pixel
      If the current position is the white pixel
        Move one pixel to the left
      If the currect position is the black pixel
        Move one pixel to the right



Source: www.imageprocessingplace.com



PROOF OF CONCEPT VIDEO



TEST VIDEO


Computer
hwadvisor
Google Chrome
CodeBlocks
ezvid
putty
Samsung Kies (Lite)
eclipse java 3 - Juno
STS - 3.2
eclipse - ee - juno
eclipse Java Kepler - S...
CetvrteAu...
2.LV-Asem...
Veza-C-A...
1.LV-Asem...
Recycle Bin
HWAdvisor
vmplayer - Shortcut
eclipse - jee - indigo
eclipse - java - indigo
eclipse java Juno novi
JAI SVN
TreceAudit...
PlayMemor... Home
slike za mentora
linkovi
PlayMemor... Home Help
Zamolba
OLYMPUS Master 2
The.Dark.K...
HP Officejet Pro 8500 ...
add media or start a new project to enable
WAJ-L
Java - KDI/src/tracking/clouds/...
FiskalC
VVG - Shortcut
TVZ - Shortcut
DOKTORAT - Shortcut
HR
0:59
28.8.2013.

PHASE: DETERMINING THE SPEED AND DIRECTIONS

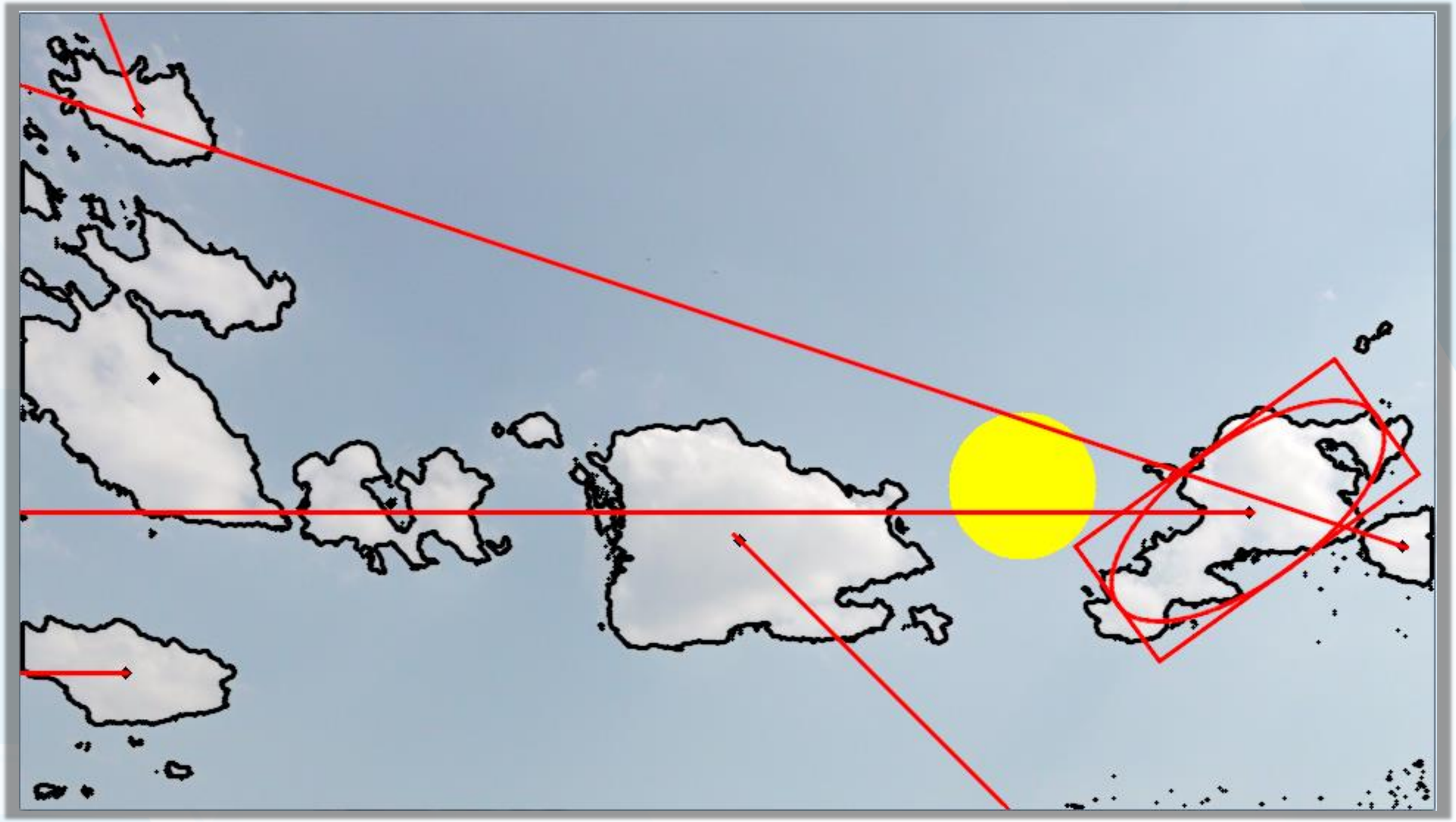
STEP 1: DETERMINING THE CENTROID OF THE CLOUD

PHASE: DETECTING THE CLOUD EDGES

STEP 2: DETERMINING THE SPEED OF CLOUD MOVEMENT

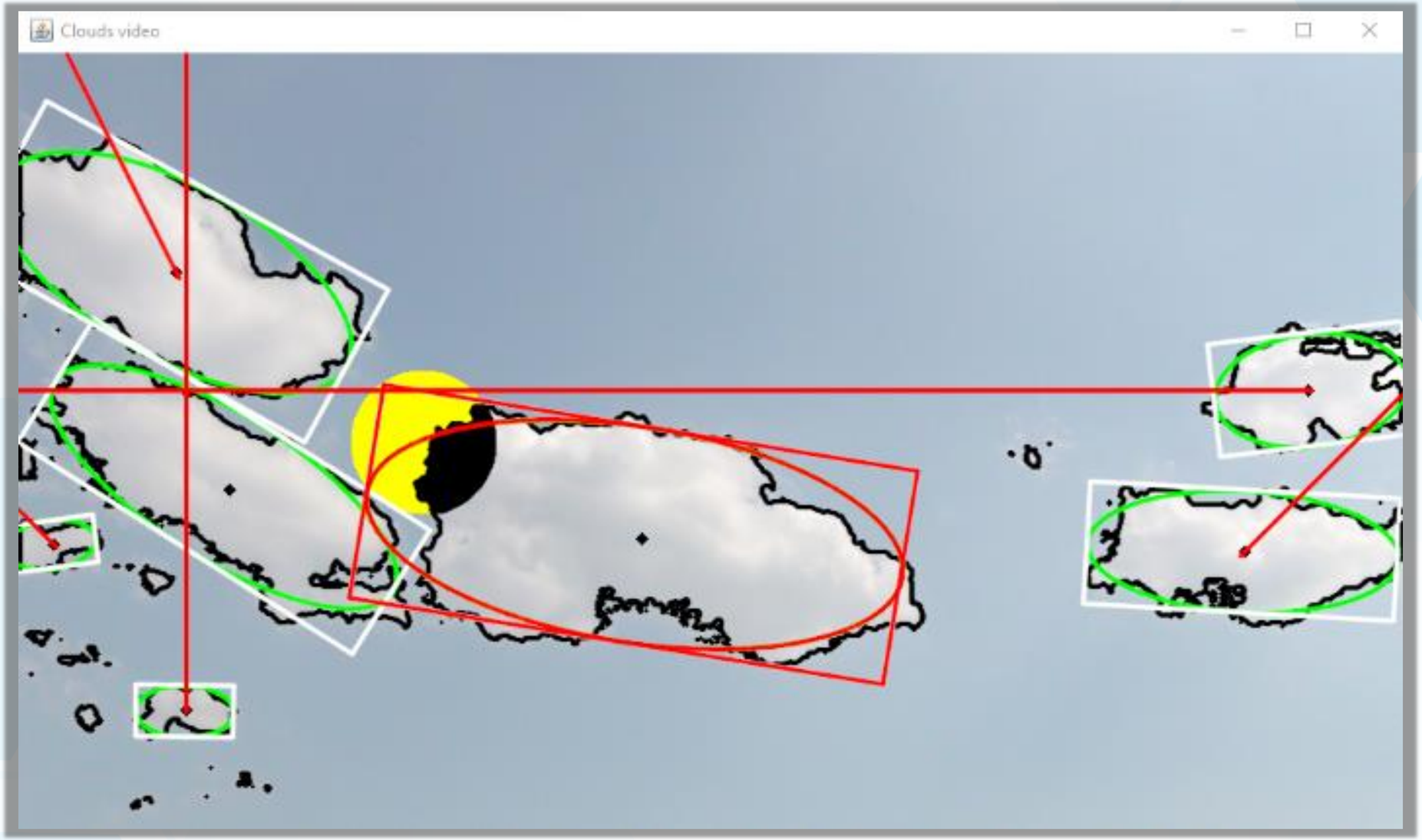
PHASE: PREDICTING THE MOMENT OF SUN COVERING

STEP 1: DETECT THE NEAREST CLOUD TO THE SUN

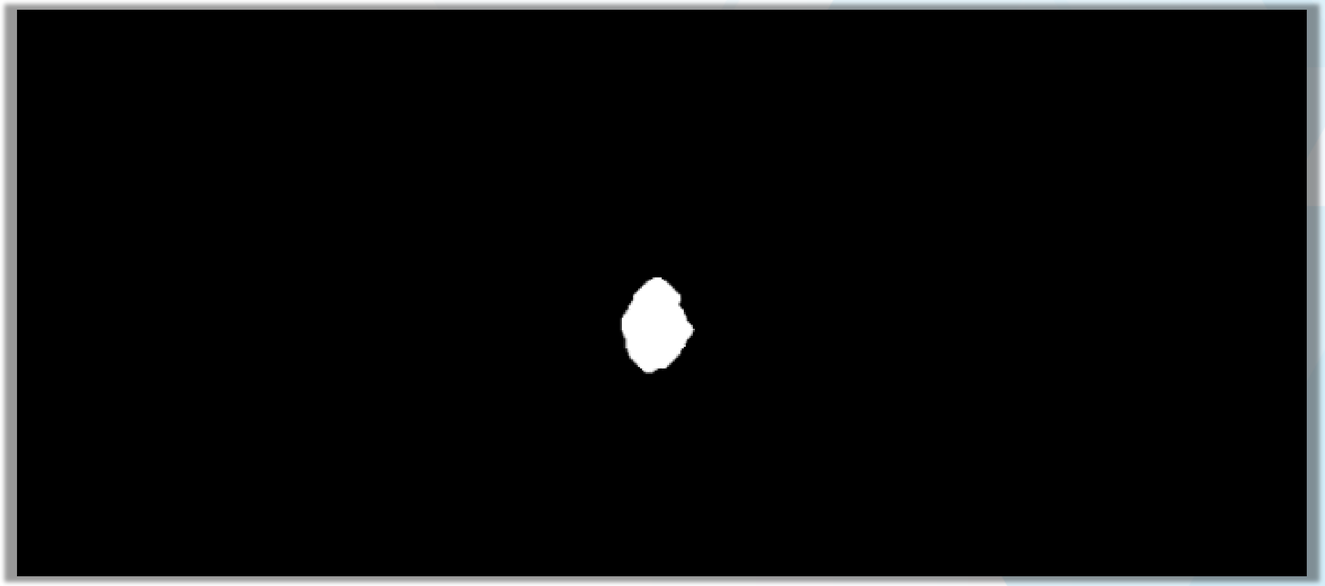


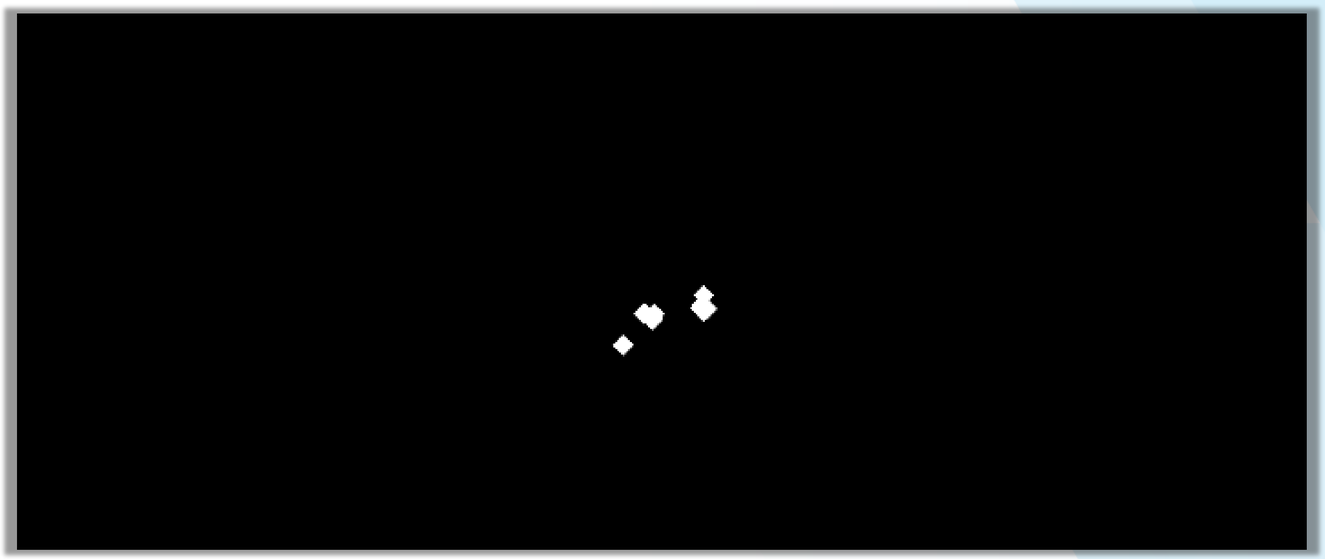
PHASE: PREDICTING THE MOMENT OF SUN COVERING

STEP 2: DETECT THE MOMENT WHEN THE SHADOW STARTS



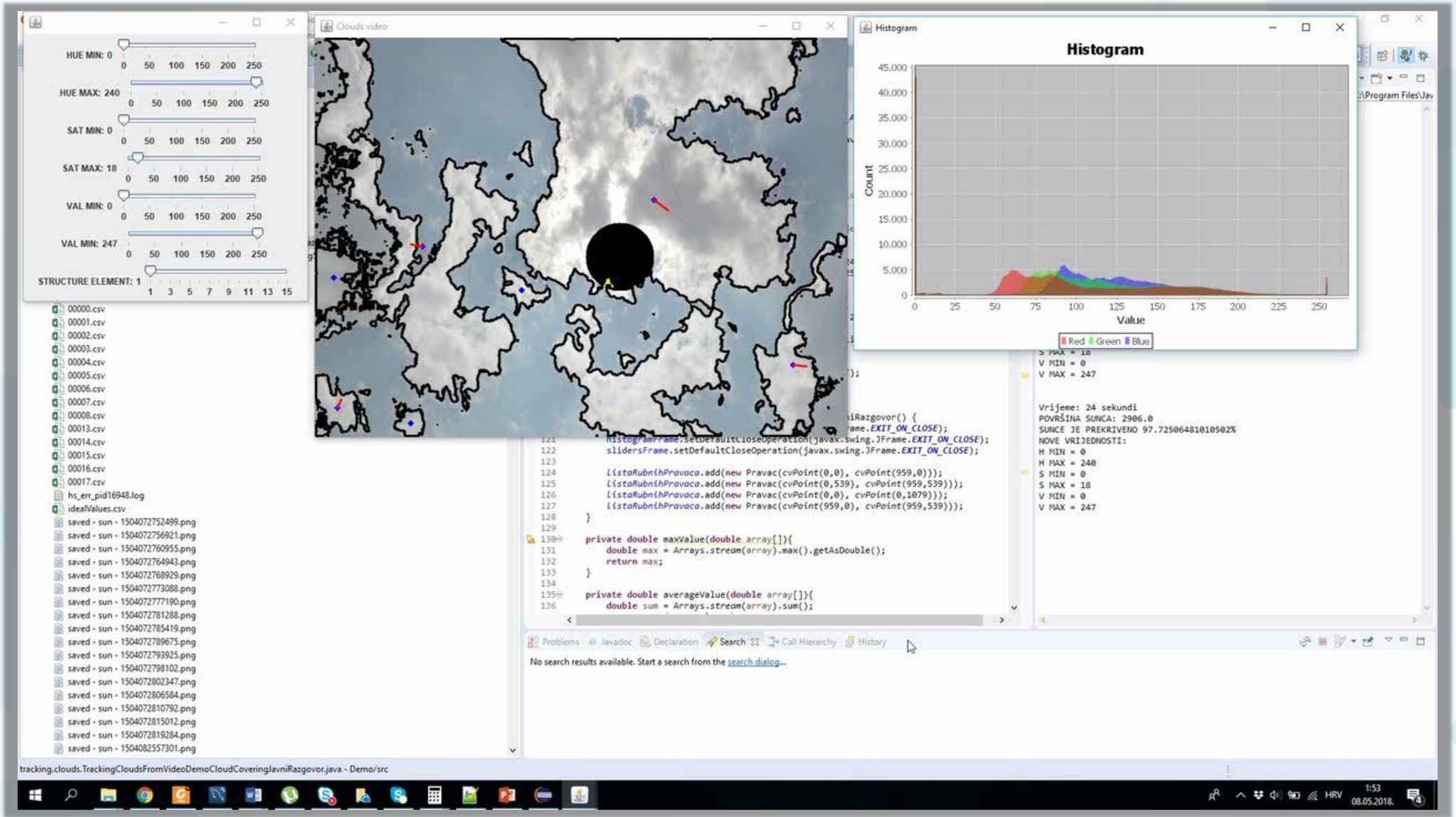
PHASE: PREDICTING THE LENGTH OF THE SHADOW





PHASE: DETECTING THE CLOUD EDGES

ADDING THE AI TO DETERMINE THE THRESHOLD LEVELS



SUMMARY

The image is taken from the video every 12 seconds

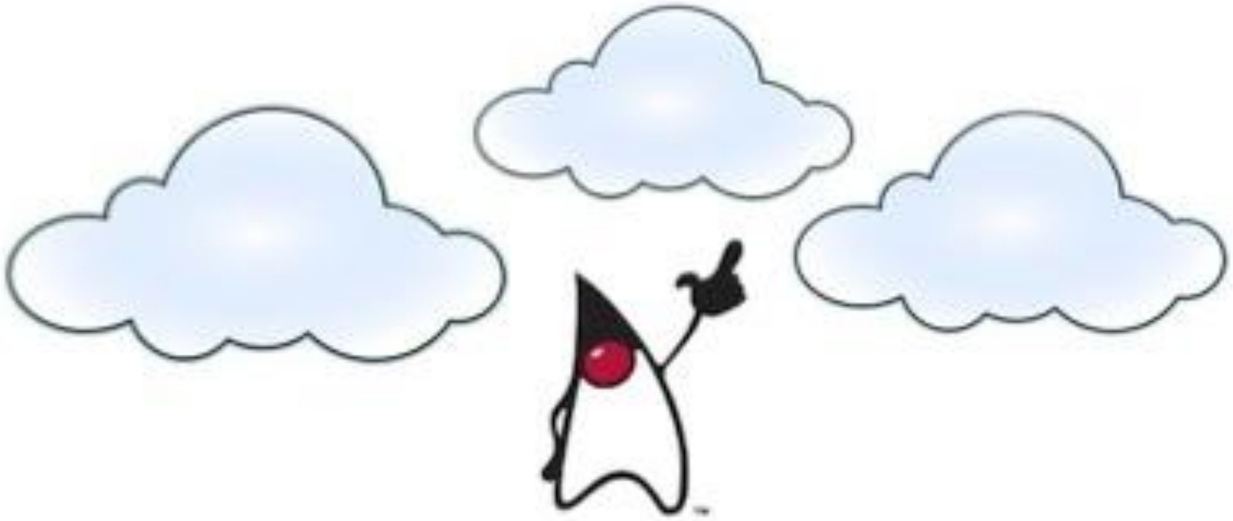
OpenCV (JavaCV) does a good job

A DLL file is needed to run it on Windows

Instead of simulating the future cloud movement, it’s better to move simulate the Sun movement

Using Java in combination with other components the solar electric system can be optimized

Thank you!



https://www.linkedin.com/in/aleksander-radovan-57a29a35/

@alex_hujak