1.1Company Profile

NVIDIA awakened the world to computer graphics when it invented the GPU in 1999. From our roots in visual computing, we've expanded into super, mobile and cloud computing. NVIDIA's mobile processors are used in smartphones, tablets and auto infotainment systems. PC gamers rely on GPUs to enjoy spectacularly immersive worlds. Professionals use them to create visual effects in movies and design everything from golf clubs to jumbo jets. And researchers utilize GPUs to advance the frontiers of science with high-performance computers.

GEFORCE: AMAZING VISUAL EXPERIENCES

QUADRO:
THE PROFESSIONALS' CHOICE

TESLA: ACCELERATING SCIENCE

TEGRA: THE MOBILE SUPER CHIP

GPU-ACCELERATED CLOUD
COMPUTING

NVidia's most notable product families are:

- **GeForce:** the gaming graphics processing products for which NVidia is best known.
- **Quadro:** computer-aided design and digital content creation workstation graphics processing products.
- **Tegra :** a system on a chip series for mobile devices.
- **Tesla:** Isdedicated general purpose GPU for high-end image generation applications in professional and scientific fields.

1.2Existing System and Need for System

Existing System: A**camera** is a device that records images that can be stored directly in the system. These images may be still photographs or moving images such asvideos or movies.

Camera is also in Tablets with feature of back camera and front camera .Basically Camera has many features like resolution, Flash mode, Night Mode, Brightness, and Contrast etc. It is necessary to test all the features correctly so that there should not be any failure while setting particular feature. So Camera should be robust and user-friendly.

In our Current System, We have to test all the features manually which is present in the camera and in addition We have to test all possible combinations of feature So Sometimes it becomes tedious job and time consuming .

There is Tool called ‘DevTest’ to test camera manually on the tablet.

Need for System:

To overcome this difficulty it is necessary to develop camera interface which uses capabilities of driver in the tablet .On present Every tablet is having camera with back front capabilities but we cannot use that to test features of camera settings ,It causes need to develop camera tool which supports back and front mode .

Also, Tool provides immediate preview on selecting mode of camera and while changing camera settings simultaneously preview also changes to show respective change to user.

1.3 Scope of Work:

- Creating UI to select Camera Mode
- Collecting Capabilities of Camera Driver and Hardware
- Creating UI which captures image after clicking on Photo Button
- Setting Camera Properties
- Content capture using above combinations
- Verification of Captured content

1.4 Operating Environment

Hardware: Tablet PC prototype

Dock

Debug Board

USB Hub

USB Keyboard and Mouse

USB debug Cable

USB NIC

Software: Win RT, desktop Win7

Visual Studio 2010 (Win32), XML

NVidia Build tools

1.5 Detail Description of Technology used

Perforce: Perforce is a commercial, proprietary revision control system. Control is the management of changes to documents, computer programs, large web sites, and other collections of information.

The Perforce server manages a central database and a master repository of file versions. The Perforce database is proprietary, preconfigured, and self-installed. It stores system-related metadata (file state, file attributes, branching and merging history, change lists, change descriptions, users, groups, labels, etc.).

Depot: Versioned file content is stored in a master directory hierarchy whose top levels are called "depots".

Workspace: Workspace is local copy of local machine, on which we can work and commit the changes which reflect files in the depot.

- **Features**
- Complete file and metadata history
- Full revision history for branched, renamed, moved, copied, and deleted files
- Graphical file content history and branch history viewers
- Graphical administrative interface
- Image thumbnails
- Programmable command-line client and API

2.1 Proposed System

This System is proposed to develop Camera and its basic settings and functionality of capturing photo and video and on the basis of that developing tool which will be helpful for testing all the combinations of settings automatically .

The proposed System is going to include all settings in camera as follows:

There are 2 options:

- Camera Options
- Custom Options

Camera Options	Custom Options
Zoom	White Balance Mode
Pan	Scene Mode
Tilt	Focus Mode
Brightness	Color Effects
Contrast	EV Compensation
Hue	AE metering Mode
Saturation	Face Detection
Sharpness	Picture Quality
Exposure	Flash
Flicker	Zero Shutter Lag
Flash	

Basic need is that while setting a value of particular setting, it should be reflected to the preview simultaneously.

2.2 Objectives of System

Our proposed system will help a lot to reduce the drawbacks as mentioned earlier with the existing system. It is advantageous in numerous ways.

Some of its advantages are :

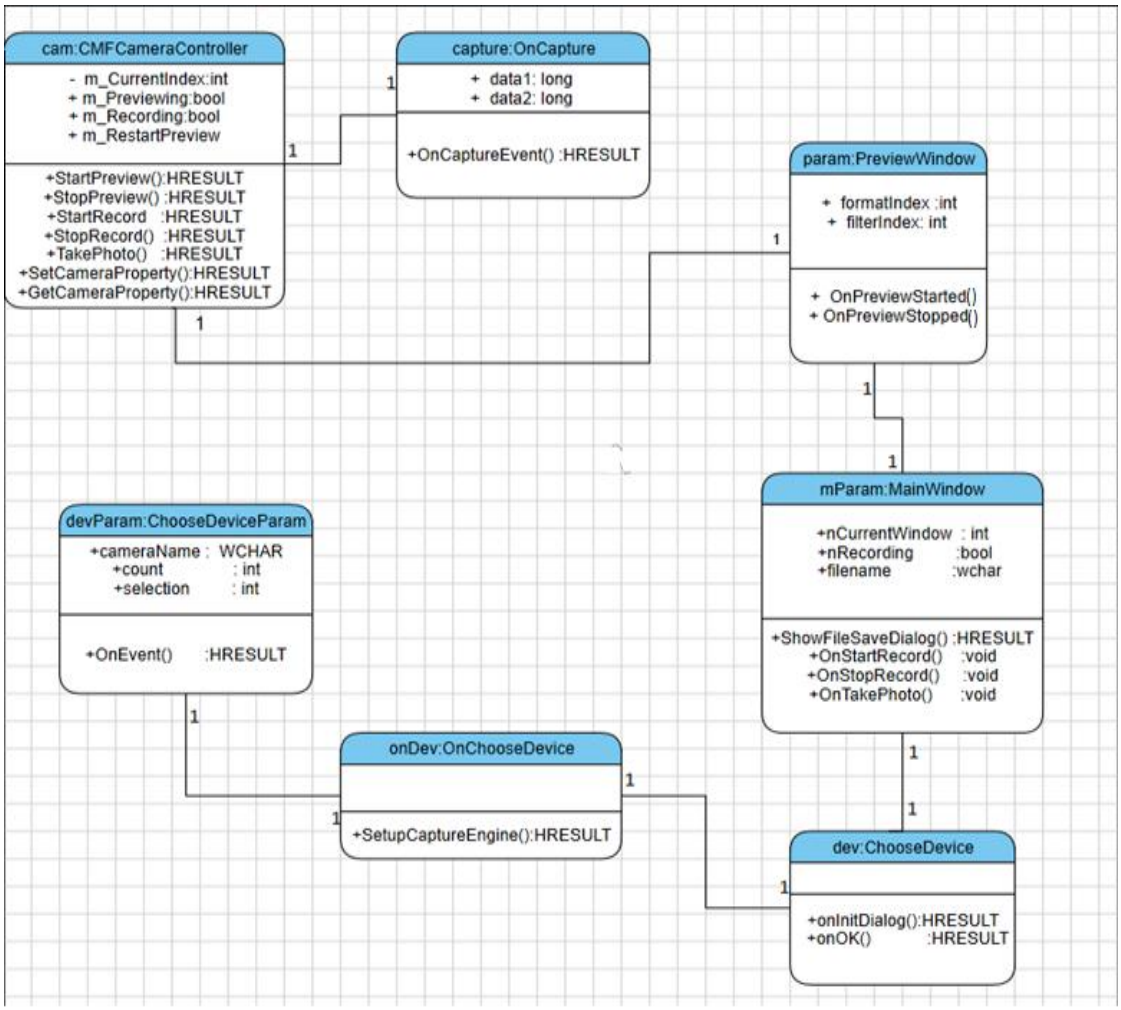
- Developing camera
- User friendly Interface
- Developing basic as well as advanced settings for camera

2.3 User Requirements

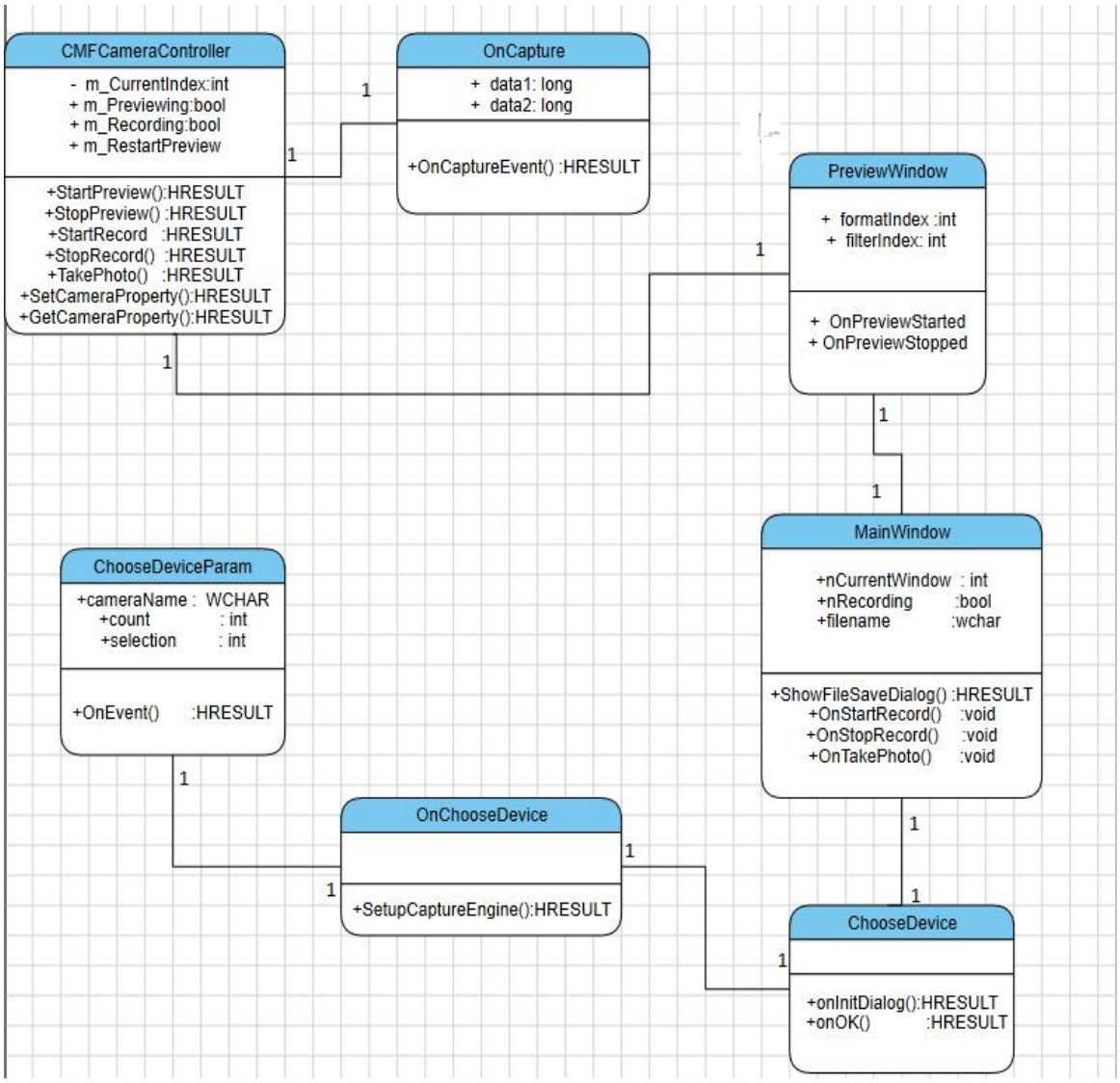
Camera tool is being done to satisfy following User requirement

- To provide camera tool to Tester
- Provide back camera and front camera
- Provide basic options and custom options
- Provide Capture and Video recording facility with all possible settings
- Simultaneous Preview change while changing settings such as basic as well as custom

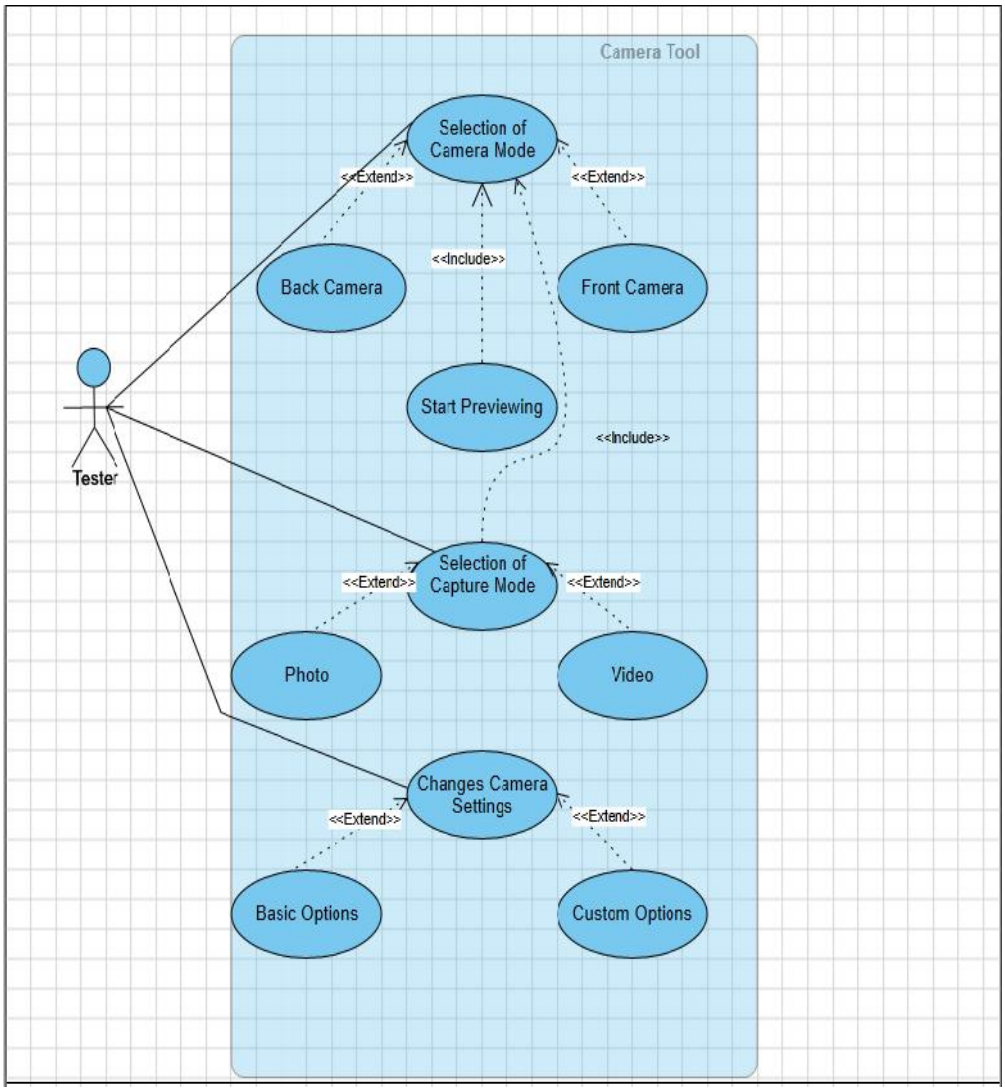
3.1 **Object Diagram**



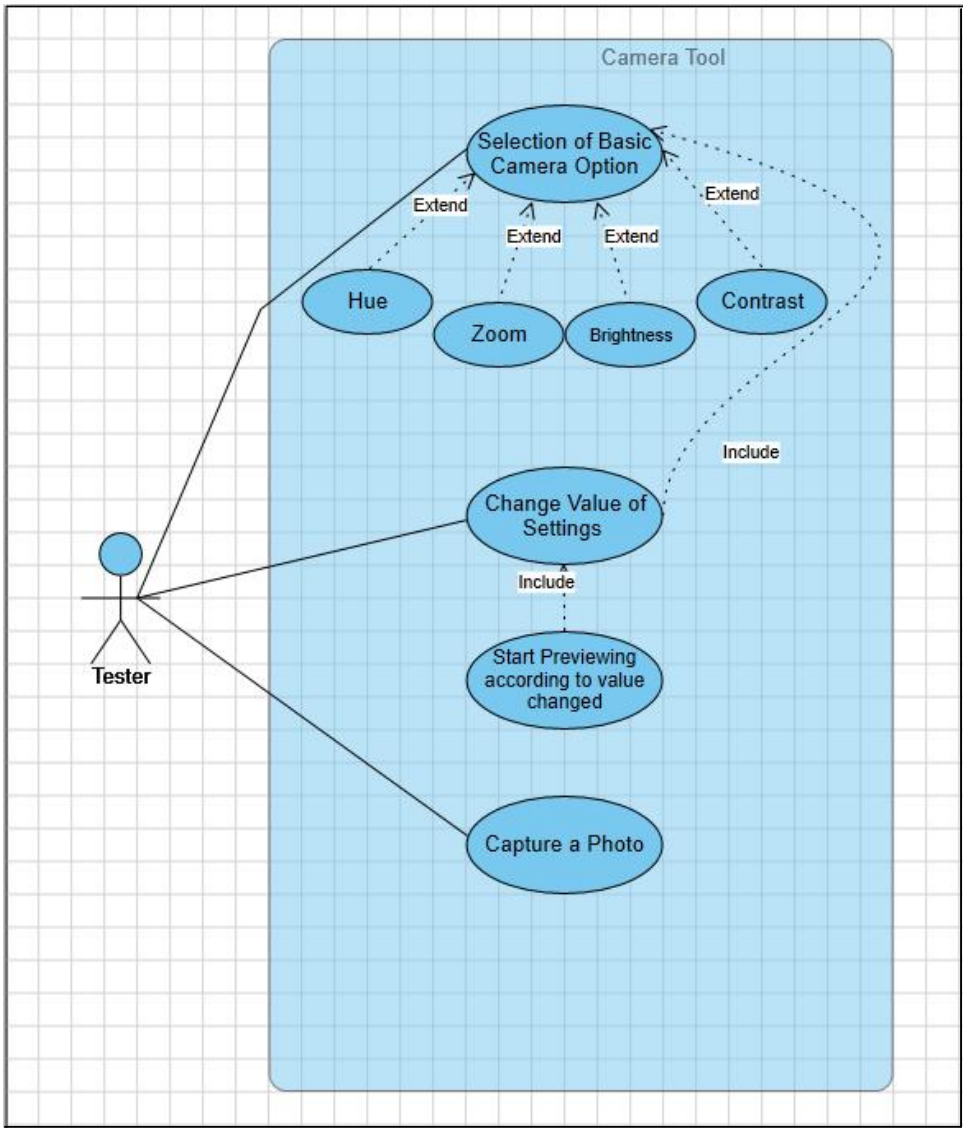
3.2 Class Diagram



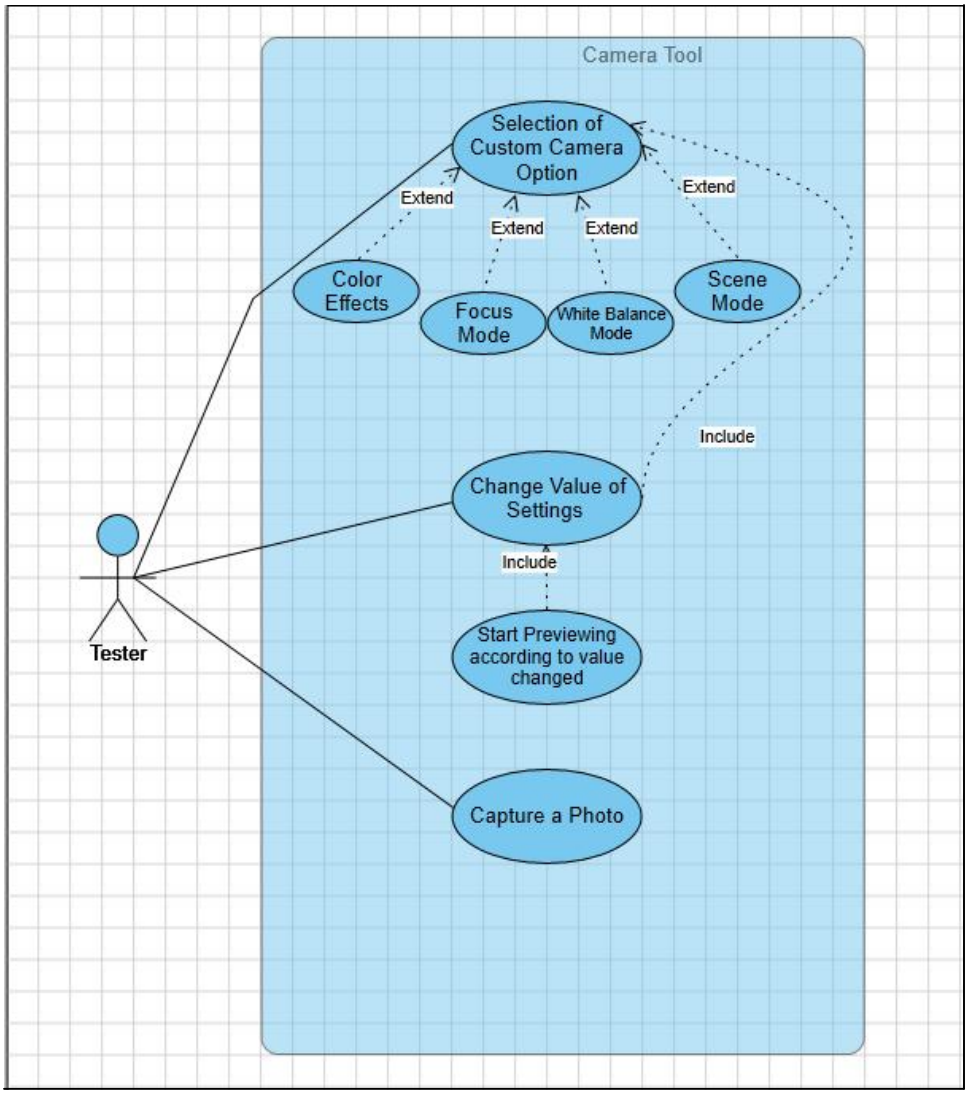
3.3 Use Case Diagram



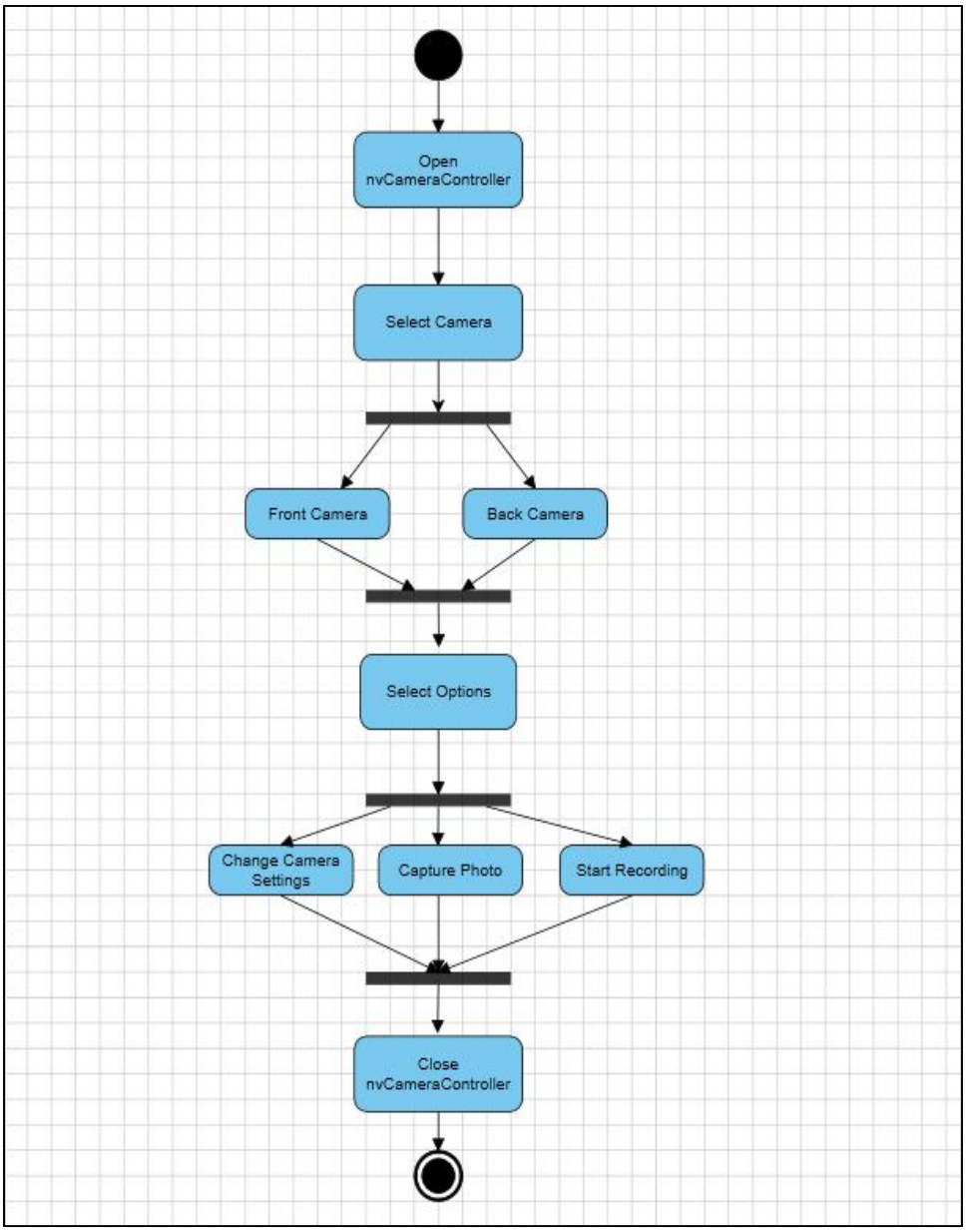
3.3 Use Case Diagram (Functionality wise)



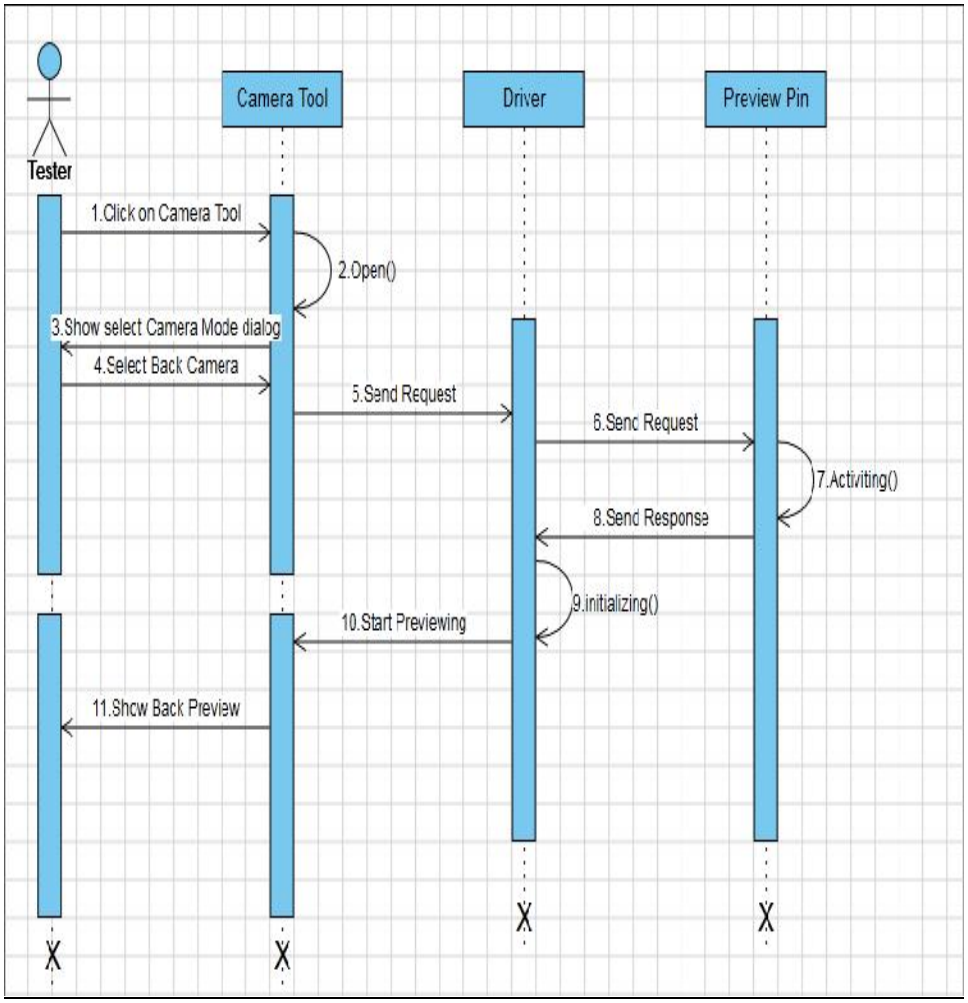
3.3 Use Case Diagram (Functionality wise)



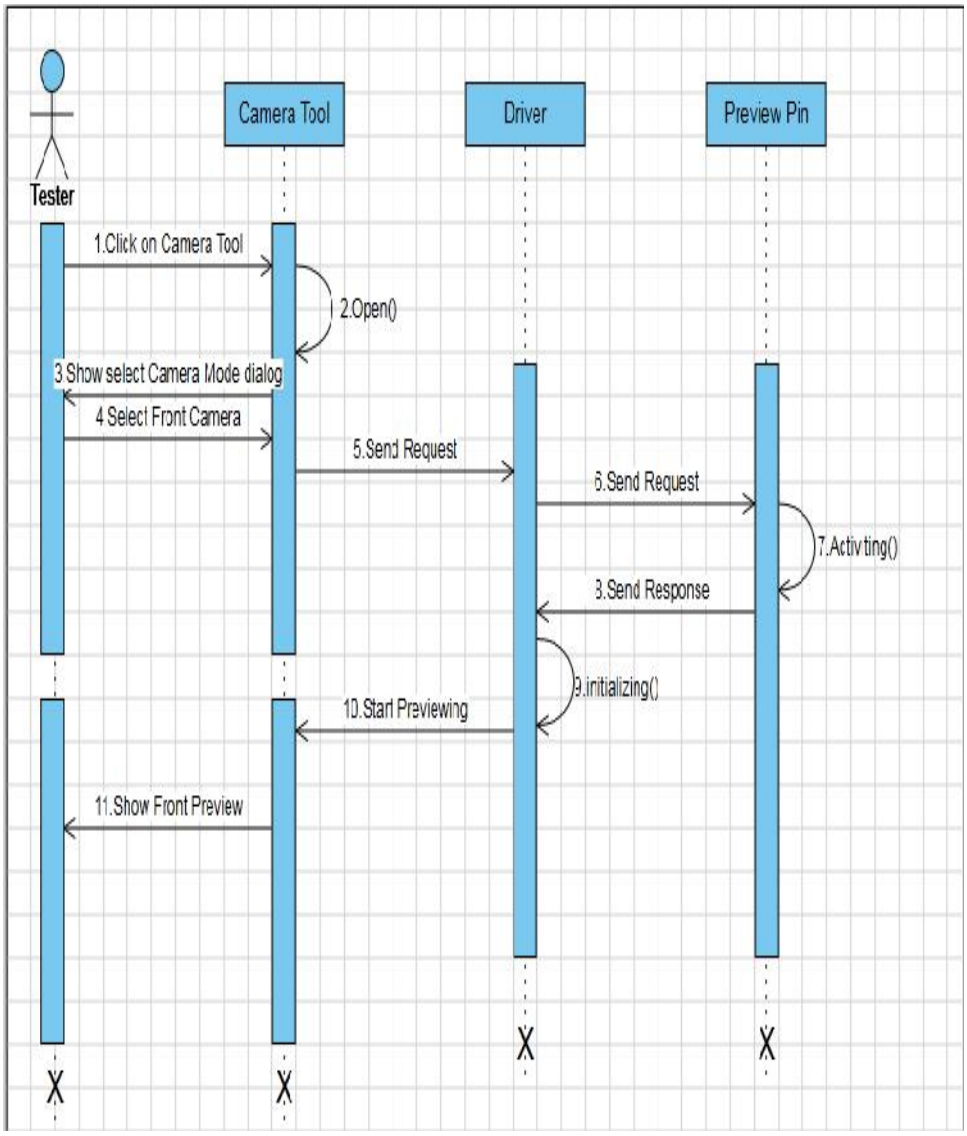
3.4 Activity Diagram



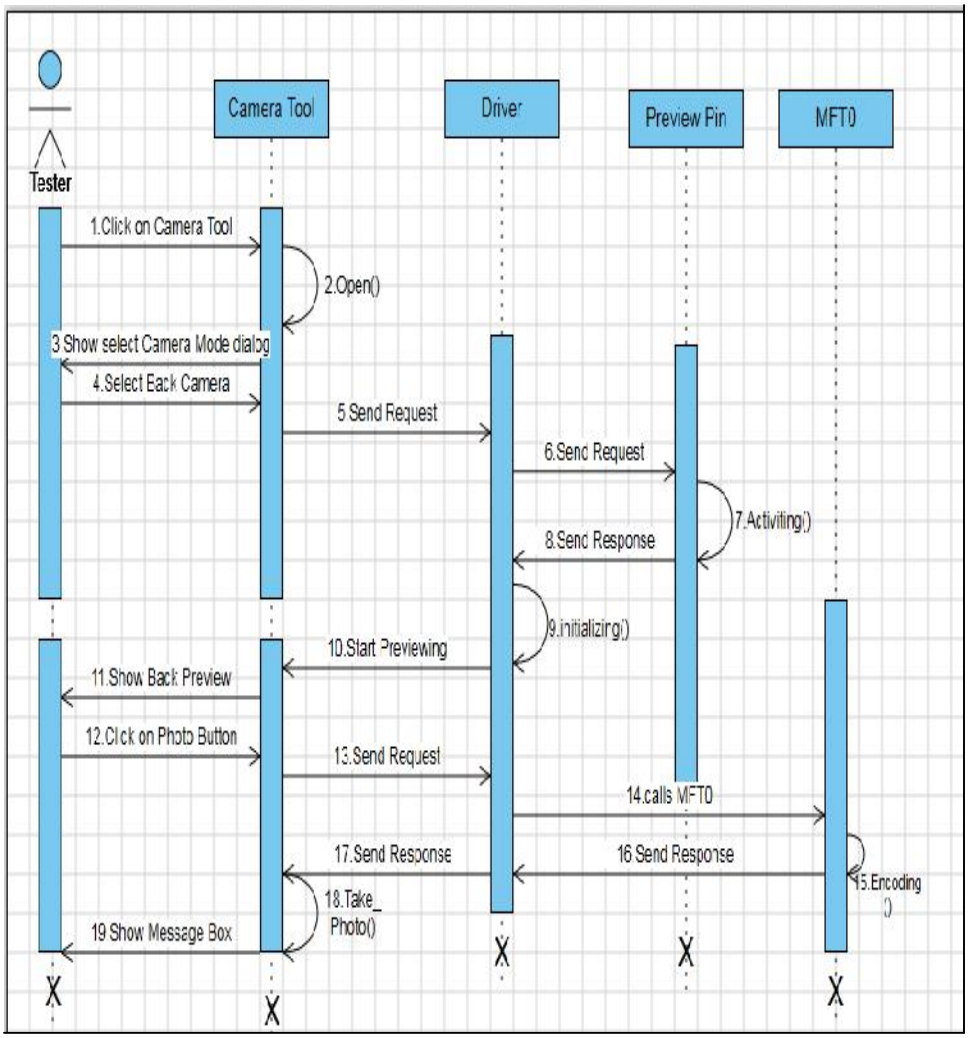
3.5 Sequence Diagram for Back Camera



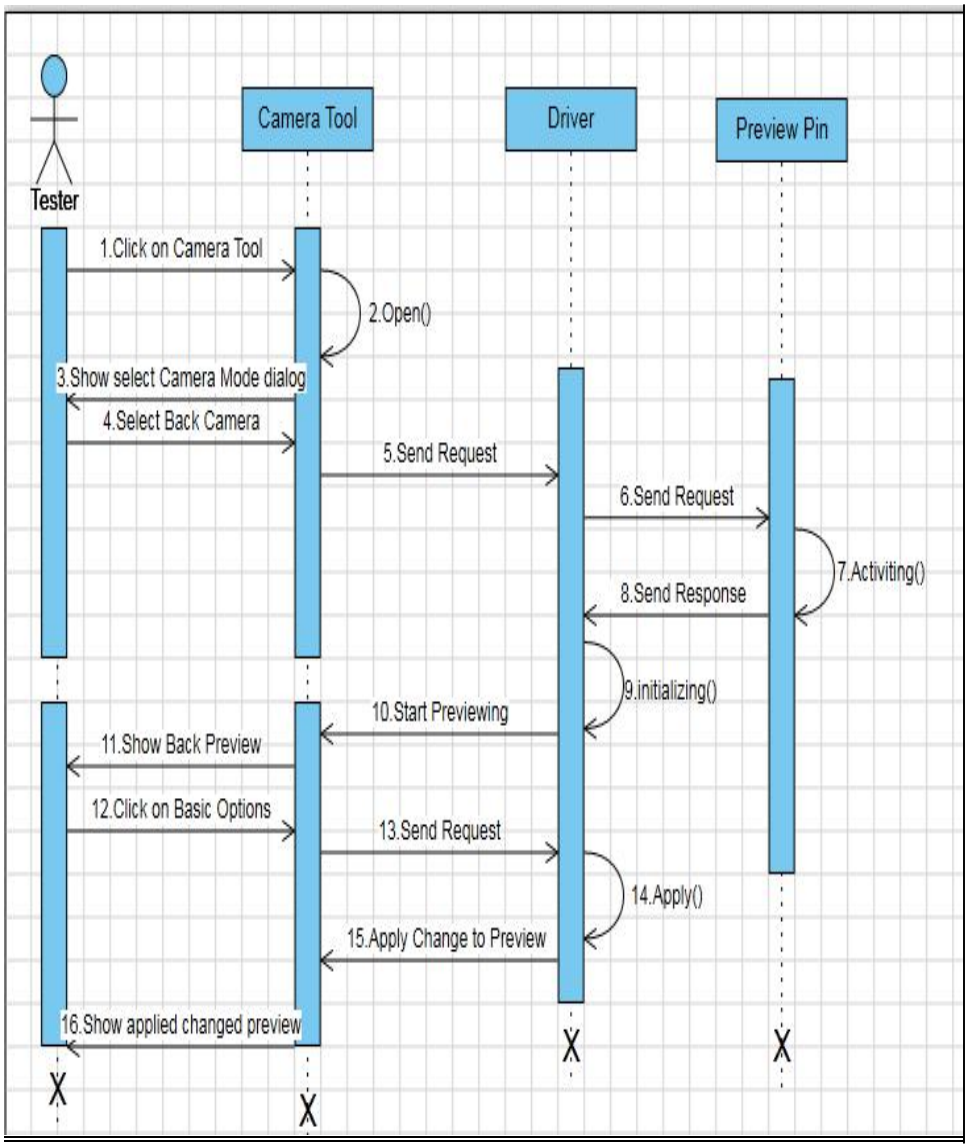
Sequence Diagram for Front Camera



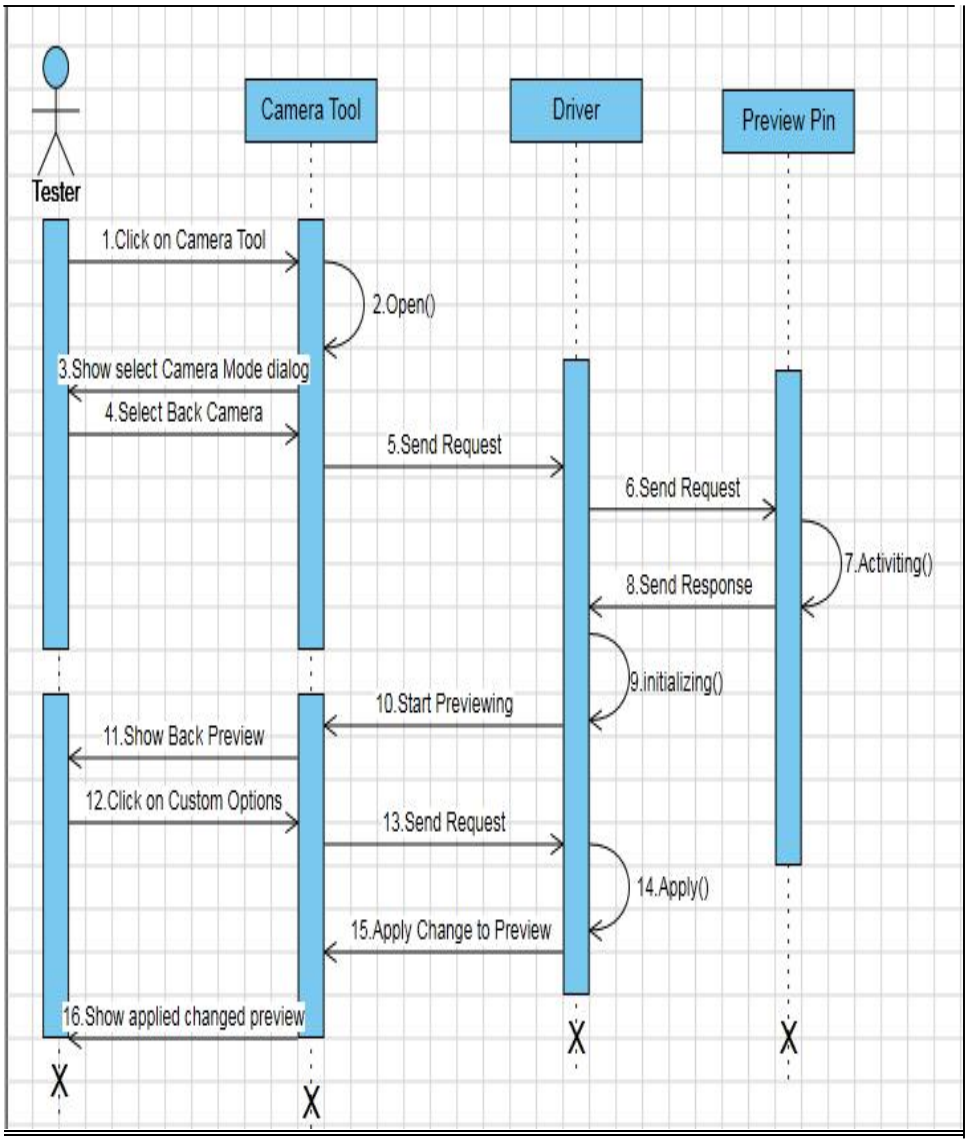
Sequence Diagram for Photo Capturing



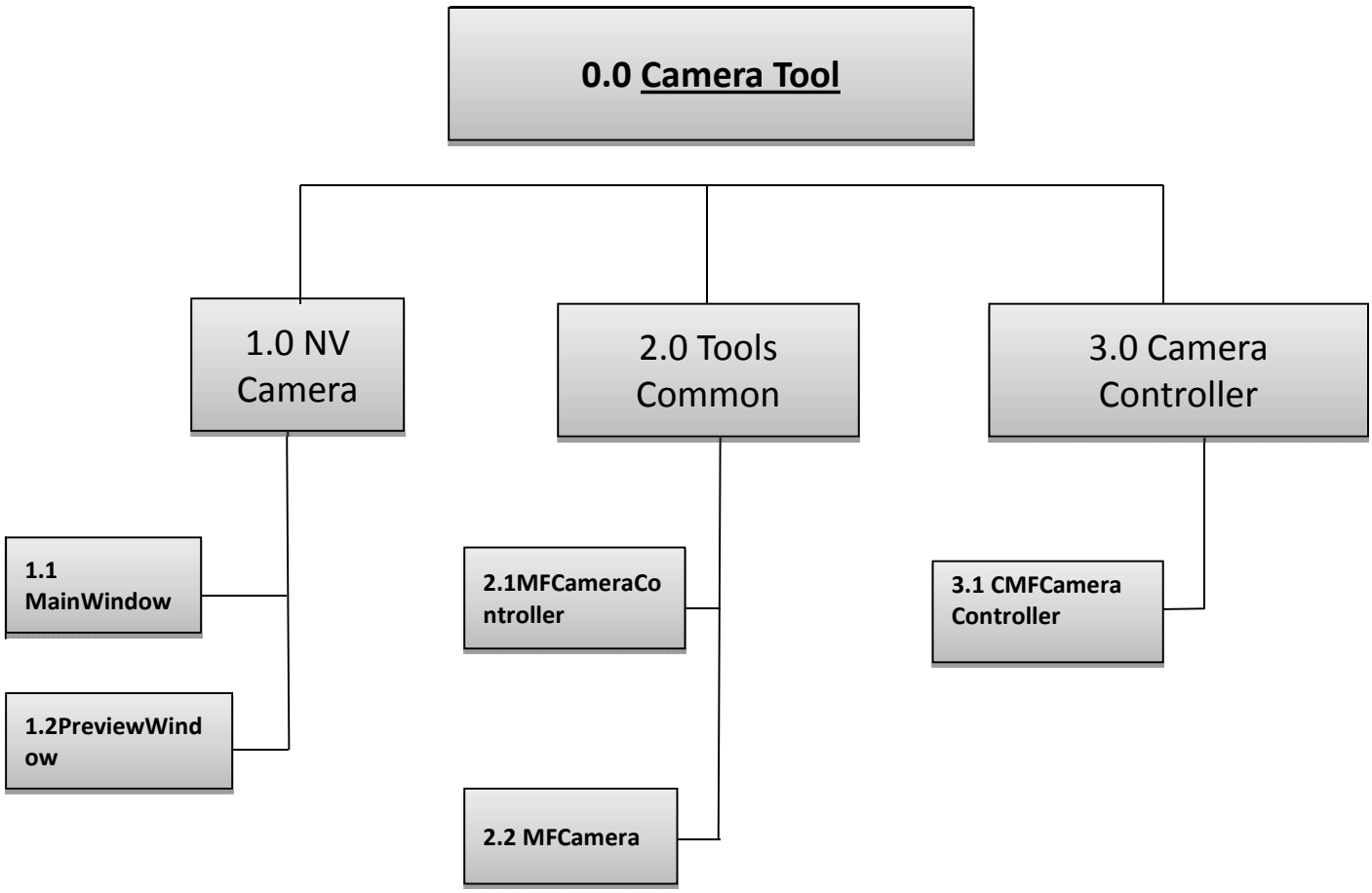
Sequence Diagram for Basic Options



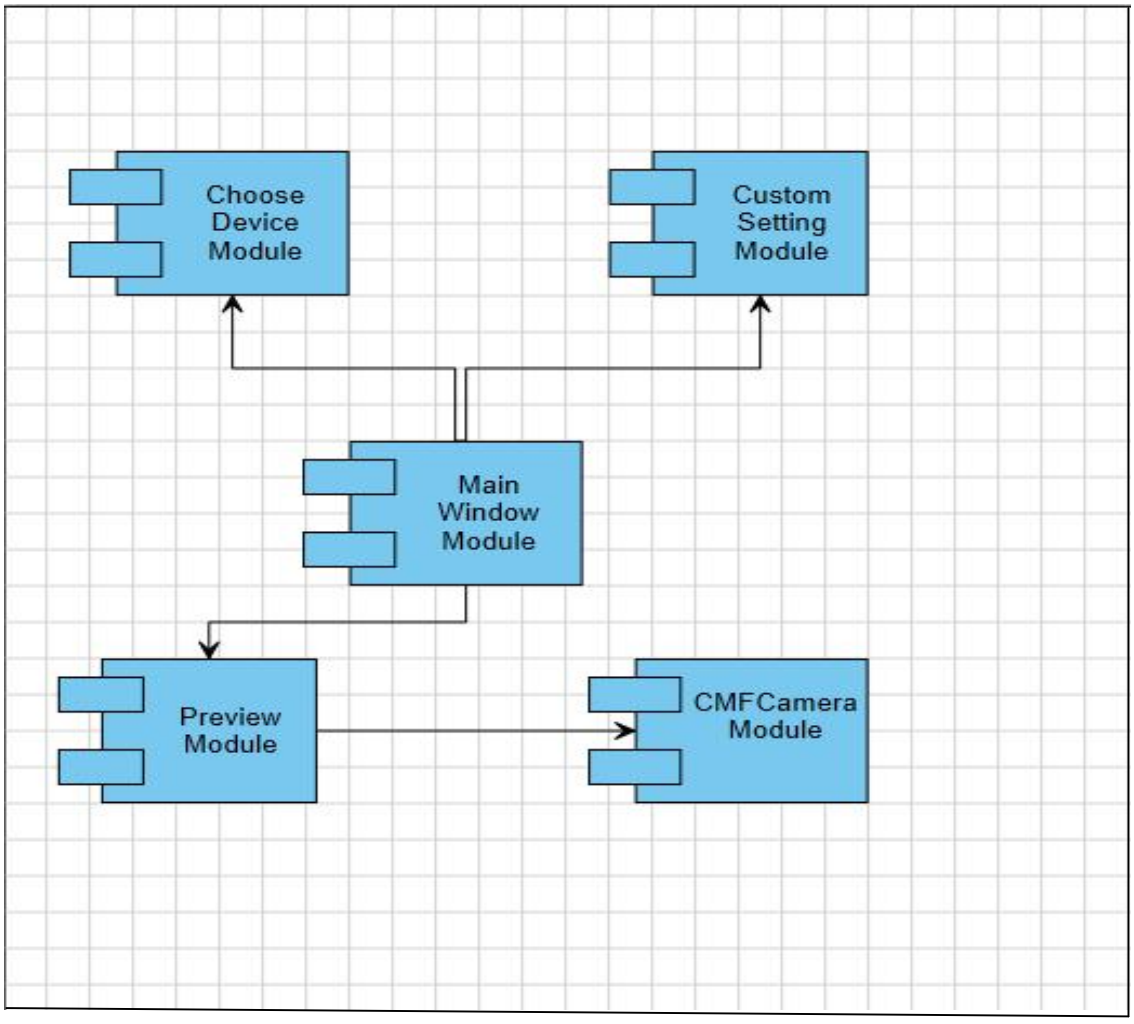
Sequence Diagram for Custom Options



3.6Module Hierarchy Diagram



3.7Component Diagram



3.8Module Specifications

MF Camera Controller: -

This module is used to declare all enums which are necessary to activate camera in tablet like all Filter Pins (PinPreview, PinVideo, PinStillImage), StartUp Mode (ModeDefault, TakePhoto, CaptureVideo, CaptureBayer), CameraProperty (Zoom, Brightness, Contrast, Saturation, Sharpness)

This module is having CMFCameraController class which is used to capture engine Event, It has declaration of many functions like OnCaptureEngineInitialized (), OnPreviewStarted(), OnPreviewStopped(),OnRecordStarted(),OnRecordStopped(),Create PhotoMediaType(),GetCameraPropertySetID(),SetupCaptureEngine (),OnCaptureEvent(),IsPreviewing(),IsRecording(),GetEventGUID() ,StartPreview(),TakePhoto() etc.

MFCamera:-

This module is used to create a compatible video format with a different subtype and also using CloneVideoMediaType () function and also create JPEG image type that is compatible with a specified video media type using CreatePhotoMediaType ()

It has many functions like GetCameraProperty (), SetCameraProperty(),

GetCameraFlashProperty() etc which accepts enum as parameter.

NVCameraController:-

This module contains four namespaces which are MainWindow ,PreviewWindow,CustomOptionWindow,OptionWindow,Eachname space contains OnCreate,OnPaint,OnSize,OnDestroy function and callback Winproc function to call particular window.

This module is the main because It starts the tool by showing Choose Device Dialog Box on the screen. Module calls to the WINMAIN function of win32 and starts executing functions which are in that function. WINMAIN function gives call to the createMainWindow function by passing hInstance to handle main Window.

To execute CreateMainWindow (), it needs functions written in the MainWindownamespace.In this namespace there is OnchooseDevice function to select camera mode (Front or Back).

This function gives call to ChooseDeviceDlgproc (it is callback function) which again calls InitDlg and OnOk function.

The ChooseDeviceDlg has defined structure choosedeviceparam .This structure is having various variables like count, selection and methods SetEventId.

In InitDlg function, it catches structure pointer as parameter. On the basis of GetDlgItem() function ,HWND collects list of devices

.Itcounts devices and stores its index ,If count is zero then there is no

device else ask user to select device.

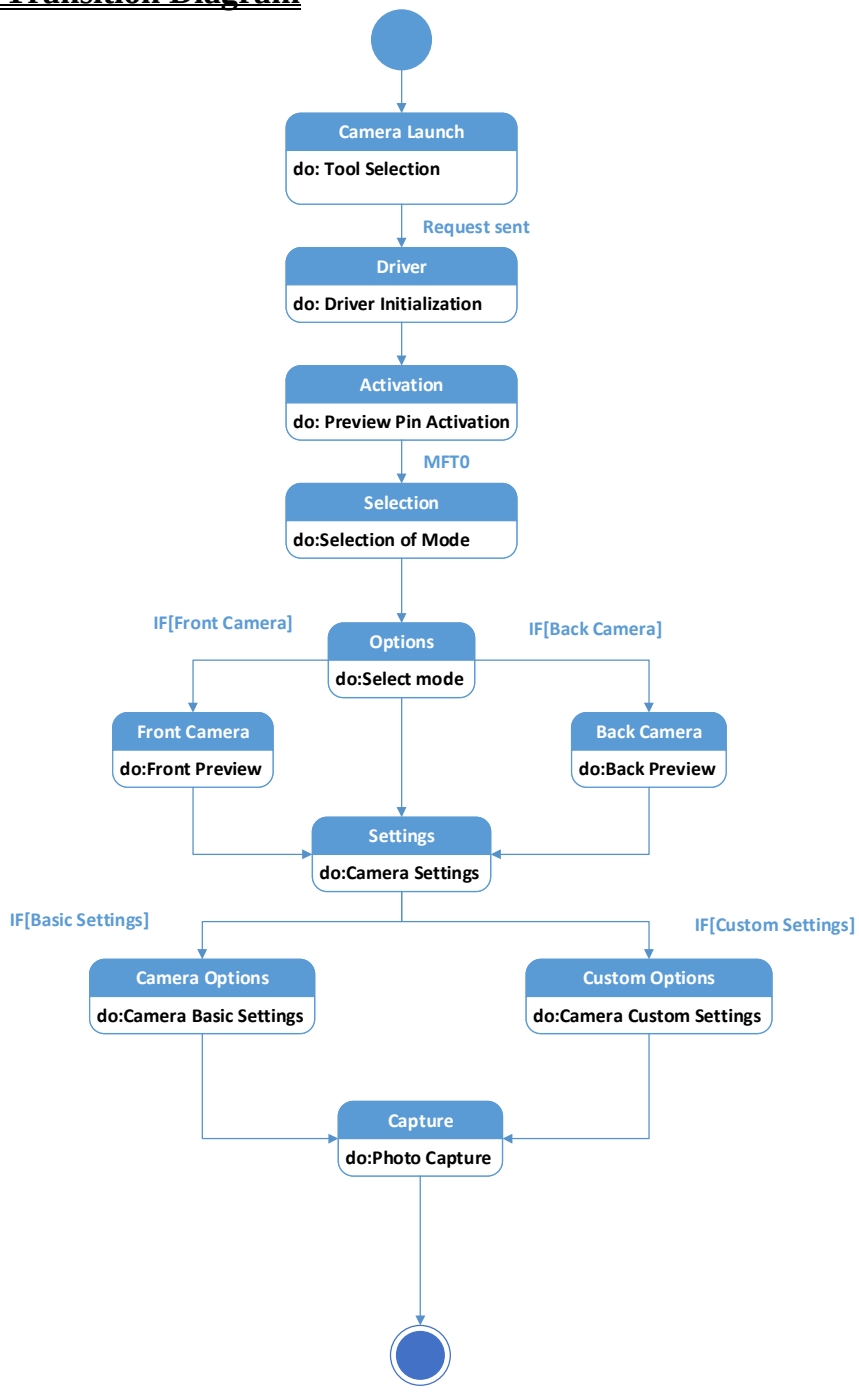
In OnOk function collects list of devices using GetDlgItem () and Get the current selection and return it to the application. It stores index in particular variable and pass that index ListBox_GetItemData.

On the basis of index which is received it displays the preview in rectangle with defined co-ordinates. If user selects Front Camera then it shows front preview and if it is back camera then it shows back Camera.

Main Window:-

Main Window contains important functions like OnCreate(),OnSize(),OnPaint(),OnDestry(),OnCommand(),UpdateUI().
OnCreate() functions calls Registry functions which are necessary to initialize driver then It creates Window which contain status text ,Toolbar text and calls Preview function
OnPaint() functions is having functions like BeginPaint and EndPaint.

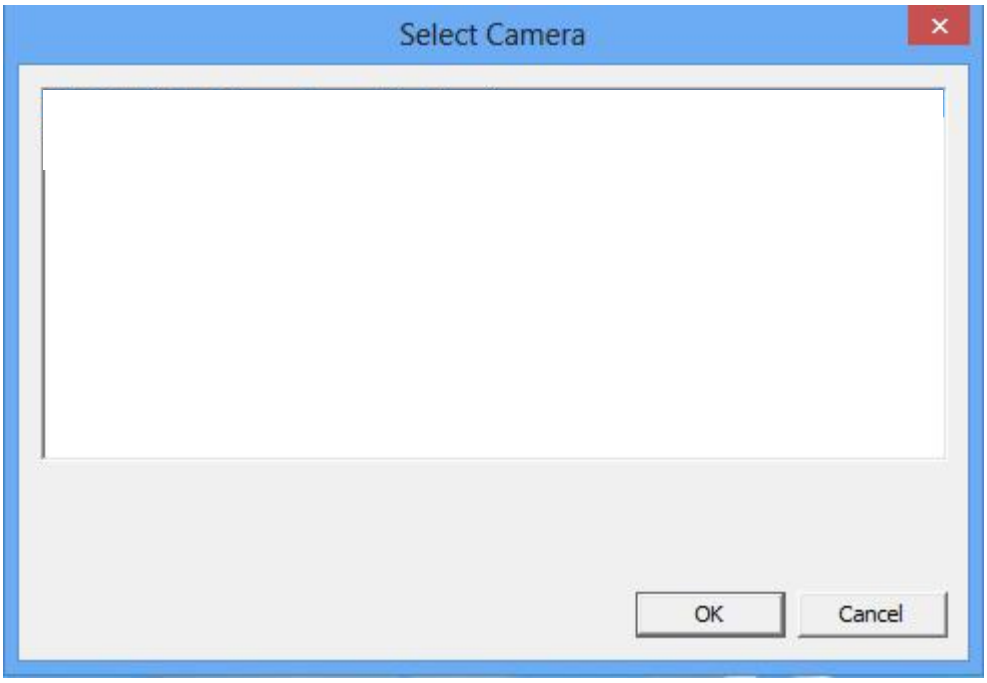
State Transition Diagram



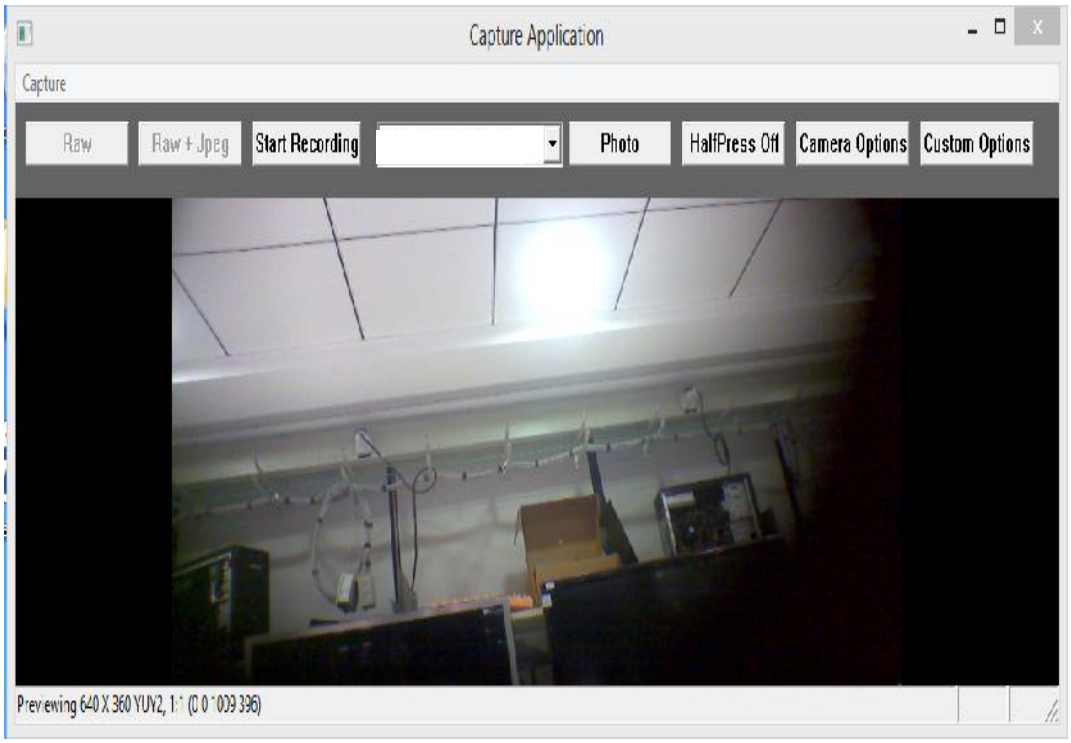
3.9User Interface Designs

Input Screens

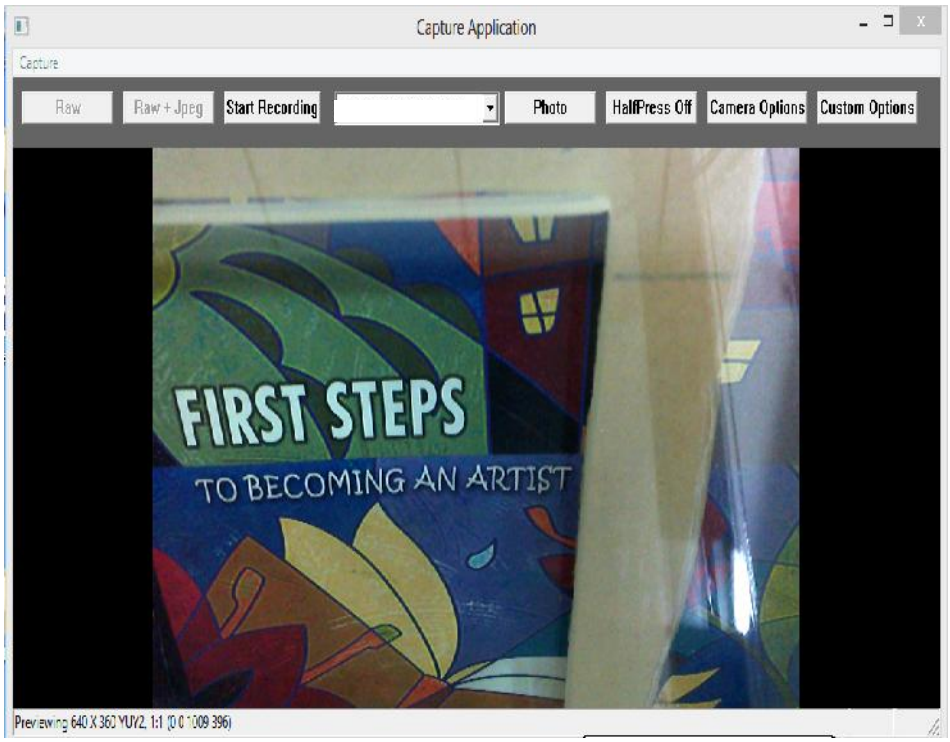
Select Camera:



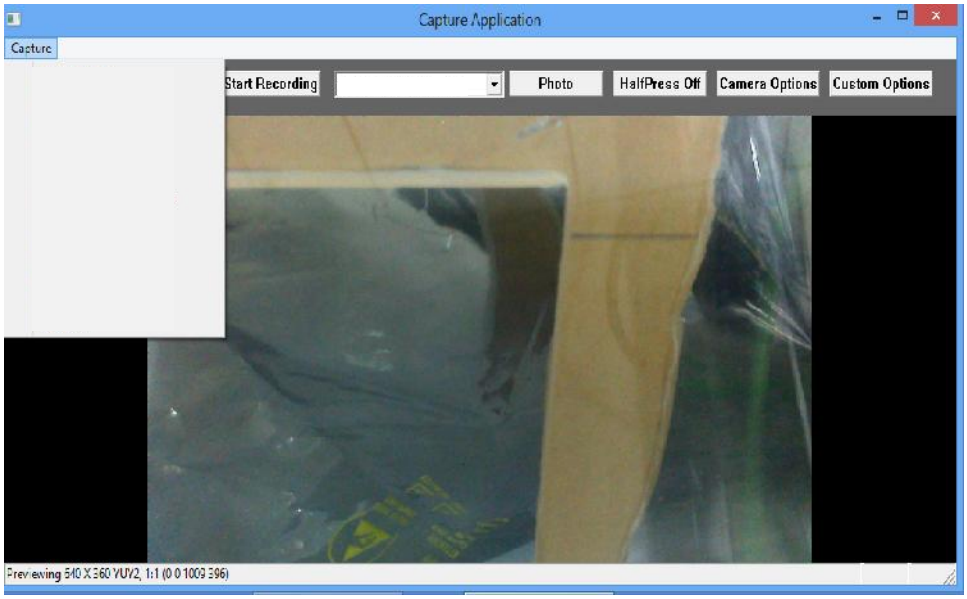
Front Camera:



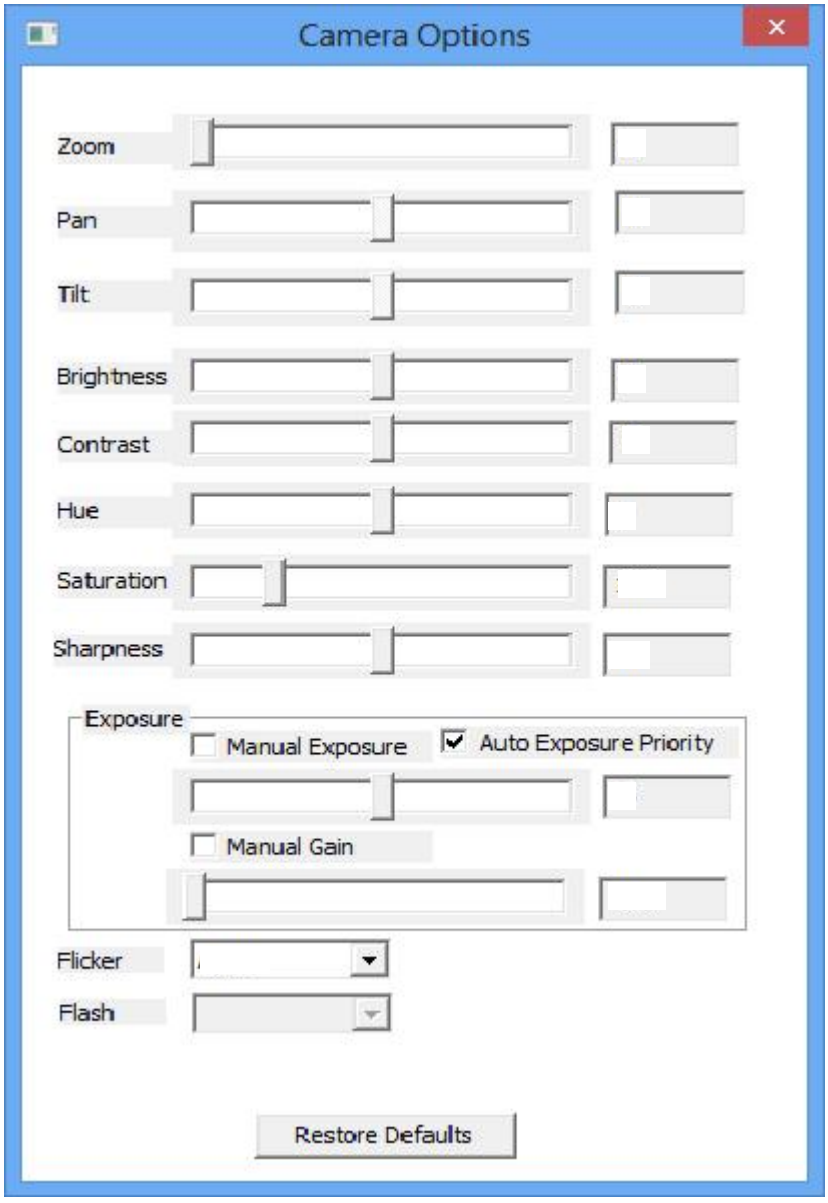
Back Camera:


Capture Application
Capture
Raw
Raw + Jpeg
Start Recording
Photo
HalfPress Off
Camera Options
Custom Options
FIRST STEPS
TO BECOMING AN ARTIST

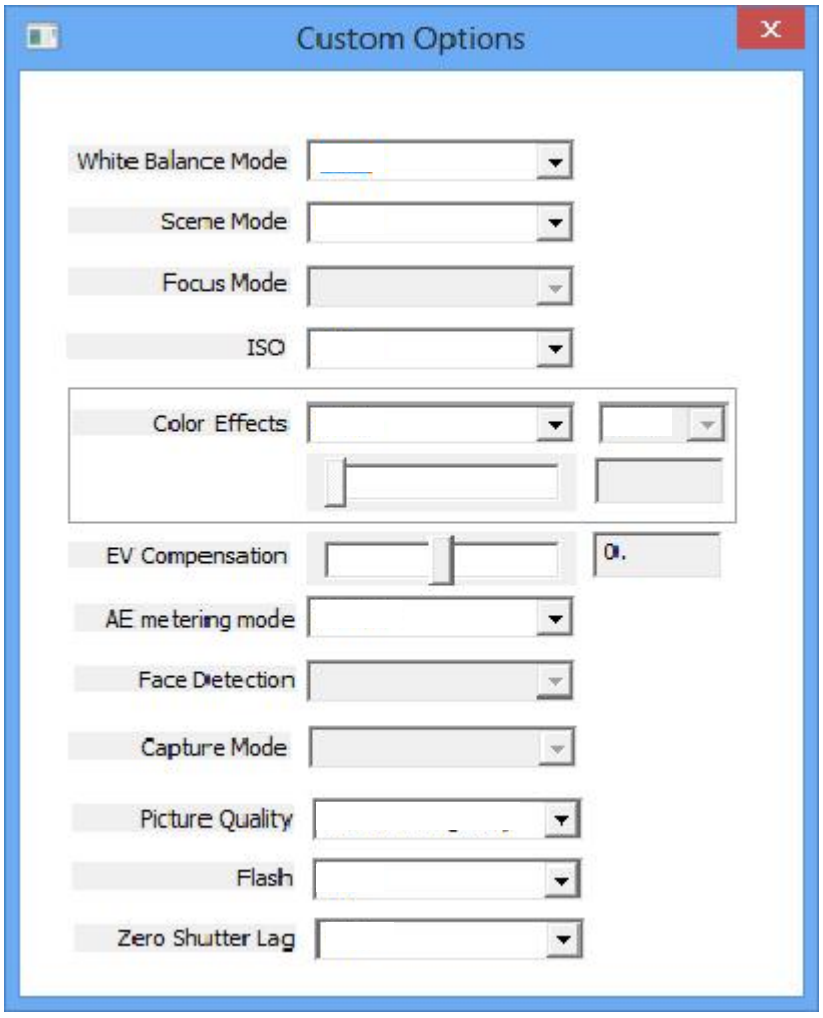
Menu Screen


Capture Application
Capture
Start Recording
Photo
HalfPress Off
Camera Options
Custom Options
Previewing 640 X 360 YUV2, 1:1 (0 0 1009 396)

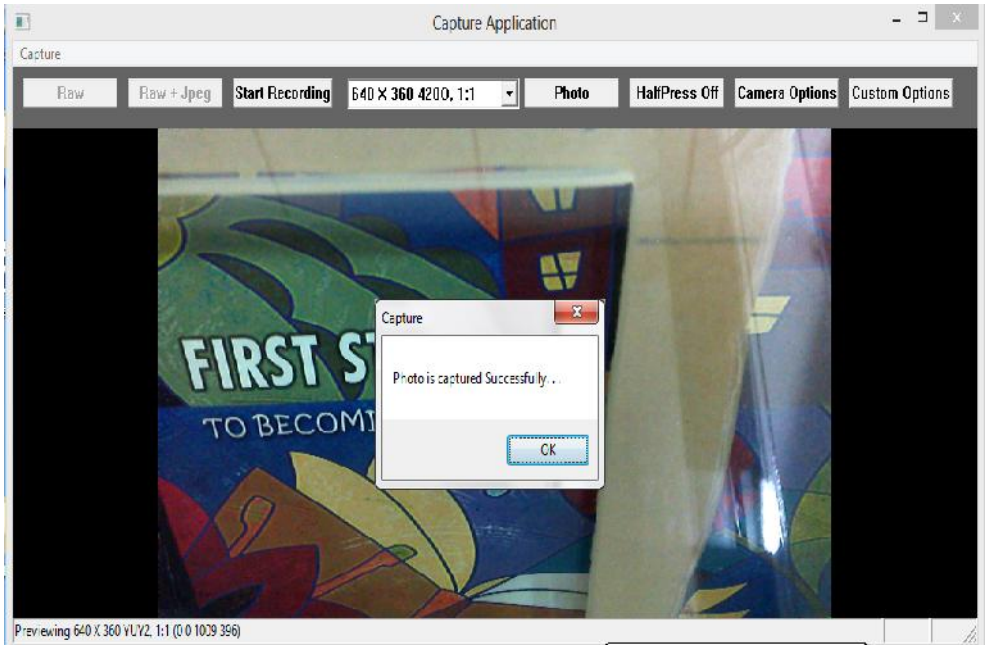
Camera Option:



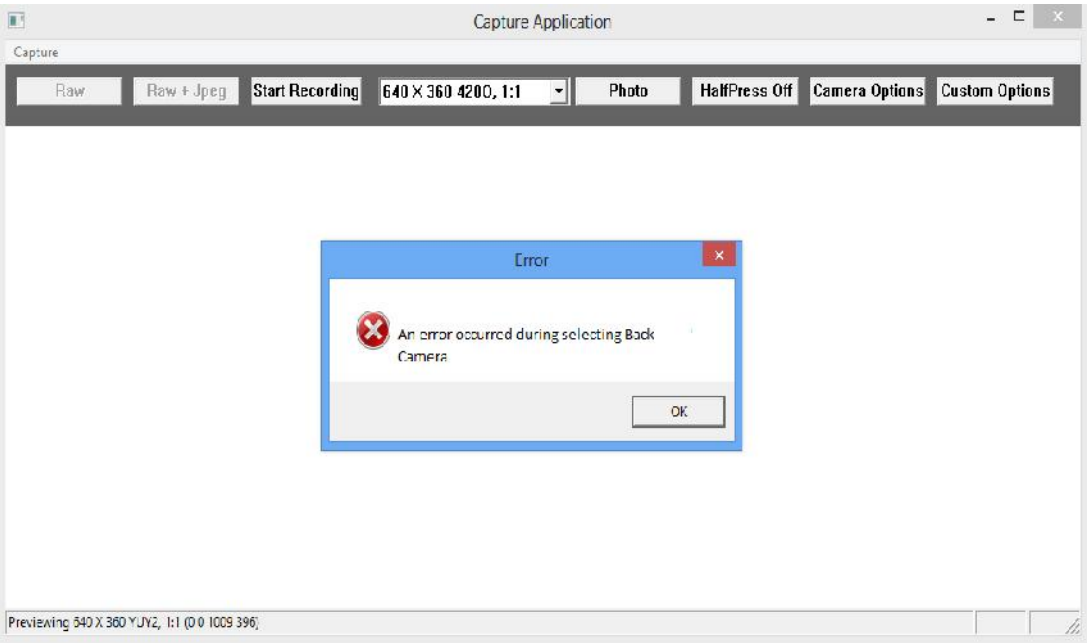
Custom Option:



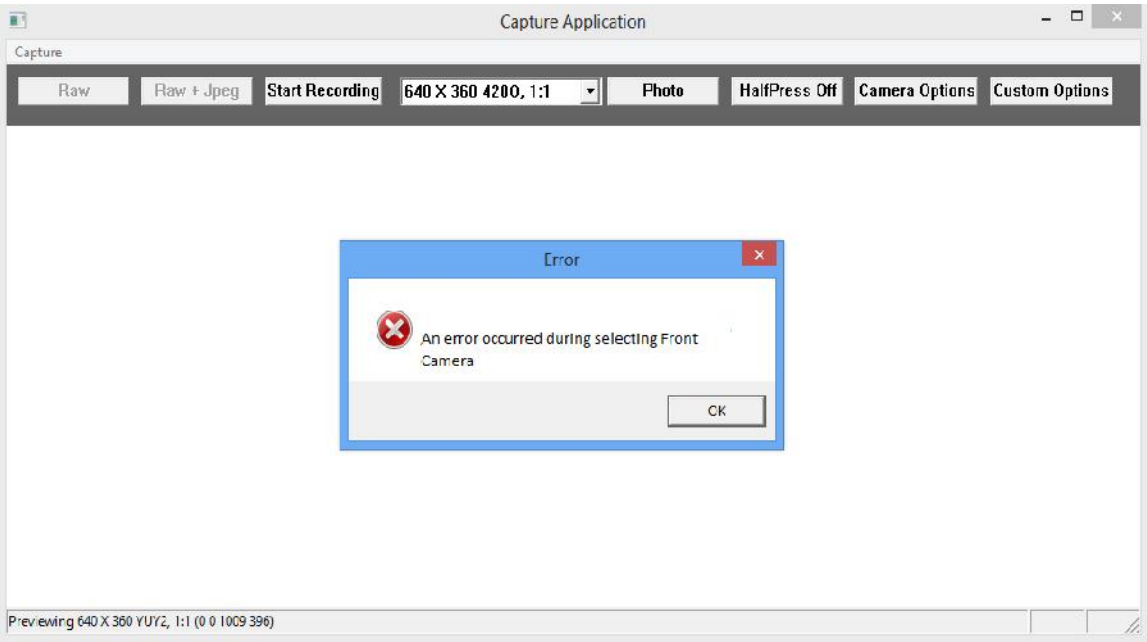
Output Screen (After capturing Photo)



Error occurred during Selecting Back Camera



Error occurred during Selecting Front Camera



3.10Test Procedures and Implementations

Testing Strategies

In this document the features that are to be developed are mentioned along with its functionality .Using this document the developer starts developing the feature whereas the test engineer starts the test cases design for the features.

Test Case Design:

The test cases are designed by considering the 3 points:

1. **User Interface level test cases**
2. **Functionality level test cases**
3. **Integration level test cases**

Test case Execution:

It is carried out by each developer in the team .The features that are developed by the developer are tested by considering the functionality of the feature and the user interface about how the interface looks like.

After the development complete, the features are given to the test engineer so that he may test out the features. The testing is carried out in cycles. The cycles of testing depends upon the number of bugs the test engineer finds in each cycle of testing .If test engineer is not able to find any further bugs then the testing cycle completes.

The testing is carried out as following:

1. **UI level testing:** First testing is carried out considering only the user interface.

2. **Functionality level testing:** In this testing the features are tested considering the functionality of the features. It is tested whether the feature works properly or not.

3. **Integration level testing:** This testing is carried out when two different features are integrated or when all the different features are integrated into one. So this testing is carried out to see whether one feature affects the other.

Testing Approach

General Approach

The Testing efforts would focus on five levels of testing namely Unit, Integration, System, Acceptance and Performance testing.

Unit Testing

Unit testing will be performed to test the functionality of individual components.

Objectives:

- Verify functional requirements for new individual components.
- Verify functional requirements for changed individual components.
- Verify functional requirements for unchanged individual components (regression testing) as time permits.
- Conduct white box testing that is testing of components which will cover all conditions and overall code.

Integration Testing

Integration testing will be performed to test the interaction between integrated components. To uncover as many defects as possible and as early in the process as possible, end to end function testing should be executed at this level.

Objectives:

- Verify integration between components.
- Verify input, outputs –operation.
- Verify error and alert messaging.
- Completion of white box testing and include black box testing (Black box testing is checking the input of data and resulting output)

System Testing

System testing will be performed to ensure the complete integrated system from end to end and can be evaluated and that system compliance with its specific requirements. This testing will validate the requirements.

Objectives:

- Verify functionality of combination of components on a particular set of hardware or operating system.
- Verify all entry points into the application
- Positive and negative passes of end to end functionality
- Regression Testing

Acceptance Testing

The purpose of Acceptance testing is to ensure that end user needs have been met or not.

Team leader, Manager will verify the business requirements have been met or not.

Acceptance testing should be completed prior to installing the components into production

Performance Testing

Performance testing will occur in parallel with system test. The focus of the test will evaluate the compliance of the system with specific performance requirements and to evaluate possible performance improvements.

Test Case ID	Condition	Step/Input	Expected Result	Actual Result	Remark
1	Selection of Front Camera	Tester selects Front Camera	Camera starts showing front preview	Camera starts showing front preview	Pass
2	Selection of Back Camera	Tester selects Back Camera	Camera starts showing back preview	Camera starts showing back preview	Pass
3	Selection of Front Camera	Tester selects Front Camera	Camera starts showing front preview	It shows Error “Front Camera is not supported ”	Fail
4	Selection of Back Camera	Tester selects Back Camera	Camera starts showing back preview	It shows Error “Back Camera is not supported ”	Fail
5	Clicking on Camera Options	Tester clicks on Camera Options	It shows Camera Settings Window	It shows Camera Settings Window	Pass
6	Clicking on Custom Options	Tester clicks on Custom Options	It shows Custom Settings Window	It shows Custom Settings Window	Pass

7	Clicking on Camera Options	Tester clicks on Camera Options	It shows Camera Settings Window	It shows Error Message “Failed to open Window”	Fail
8	Clicking on Custom Options	Tester clicks on Custom Options	It shows Custom Settings Window	It shows Error Message “Failed to open Window”	Fail
9	Changing value of Zoom	Tester changes Zoom value from default value	Zooming Effect should be seen on the preview window simultaneously	Preview is having zooming effect	Pass

Test Case ID	Condition	Step/Input	Expected Result	Actual Result	Remark
10	Changing value of Pan	Tester changes Pan value from default value	Panning Effect should be seen on the preview window simultaneously	Preview is having panning effect	Pass
11	Changing value of Tilt	Tester changes Tilt value from default value	Tilt Effect should be seen on the preview window simultaneously	Preview is having tilt effect	Pass
12	Changing value of Zoom	Tester changes Zoom value from default value	Zooming Effect should be seen on the preview window simultaneously	There is no change in the preview	Fail
13	Changing value of Pan	Tester changes Pan value from default value	Panning Effect should be seen on the preview window simultaneously	There is no change in the preview	Fail
14	Changing value of Tilt	Tester changes Tilt value from default value	Tilt Effect should be seen on the preview window simultaneously	There is no change in the preview	Fail

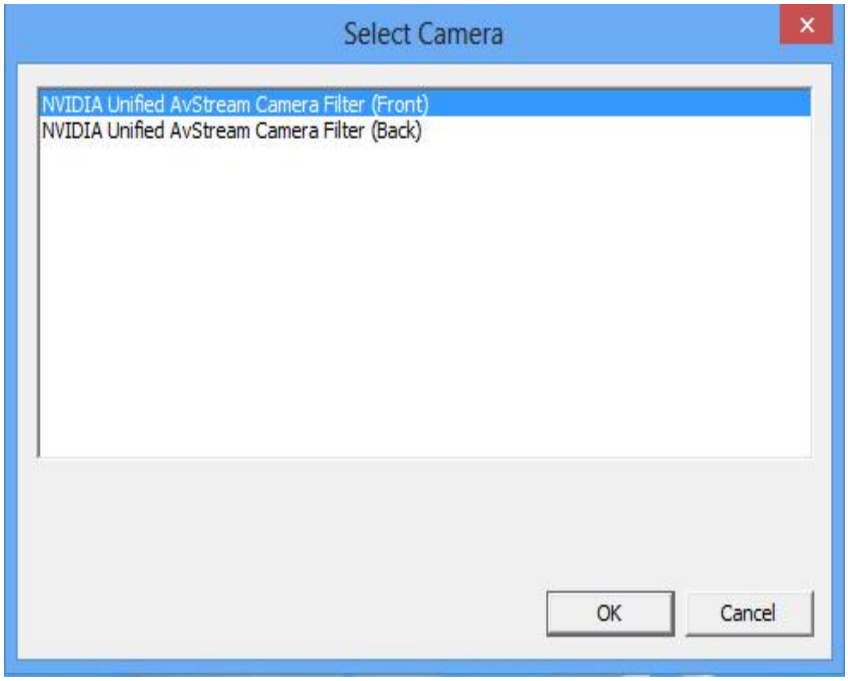
Test Case ID	Condition	Step/Input	Expected Result	Actual Result	Remark
15	Changing value of brightness	Tester changes brightness value from default value	Brightness Effect should be seen on the preview window simultaneously	Preview is having brightness effect	Pass
16	Changing value of contrast	Tester changes contrast value from default value	Contrast Effect should be seen on the preview window simultaneously	Preview is having contrast effect	Pass
17	Changing value of brightness	Tester changes brightness value from default value	Brightness Effect should be seen on the preview window simultaneously	There is no change in the preview	Fail
18	Changing value of contrast	Tester changes contrast value from default value	Contrast Effect should be seen on the preview window simultaneously	There is no change in the preview	Fail
19	Capturing a photo	Tester clicks on Photo button to capture photo	After Clicking once ,Button should be disabled	After Clicking once ,Button gets disabled	Pass

Test Case ID	Condition	Step/Input	Expected Result	Actual Result	Remark
20	Capturing a photo	Tester clicks on Photo button to capture photo	After Clicking once ,Button should be disabled	After Clicking once ,Button still is in enabled position	Fail

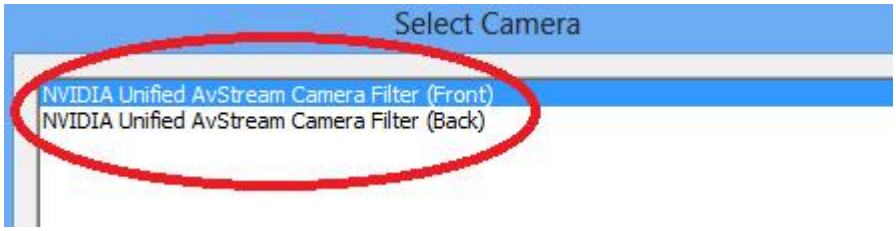
4.1 User Manual

1. Click on the nvCameraController icon on the tablet.

2. After clicking on the icon, Choose Device window will open.

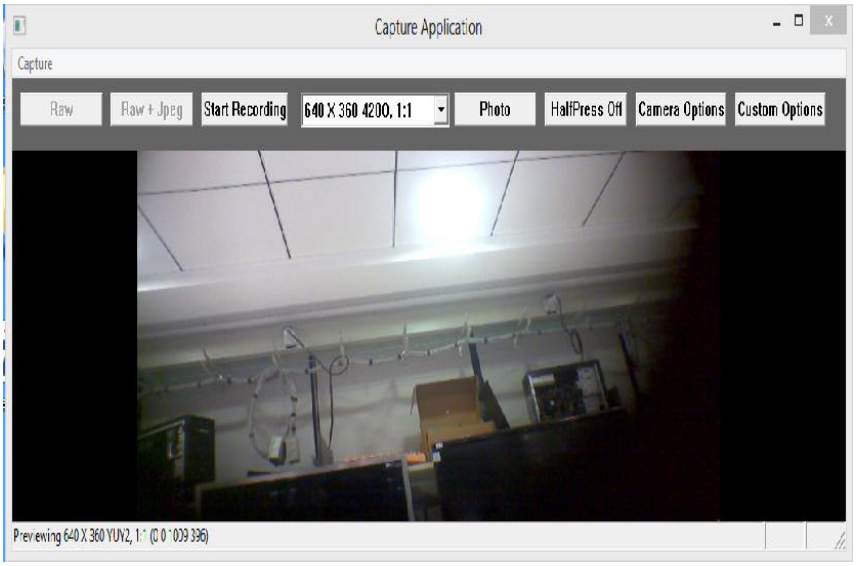


3. There are two options Back camera and Front Camera.

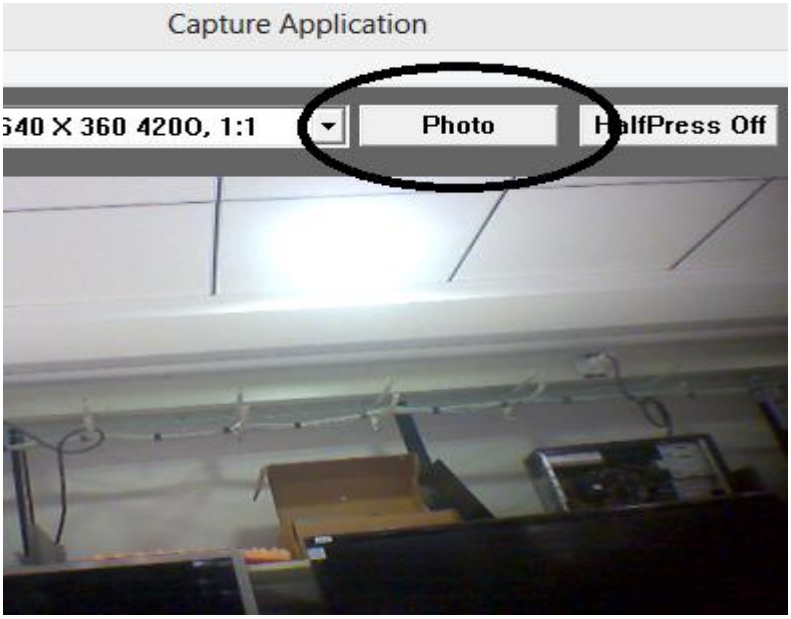


4. User can select either front or back camera.

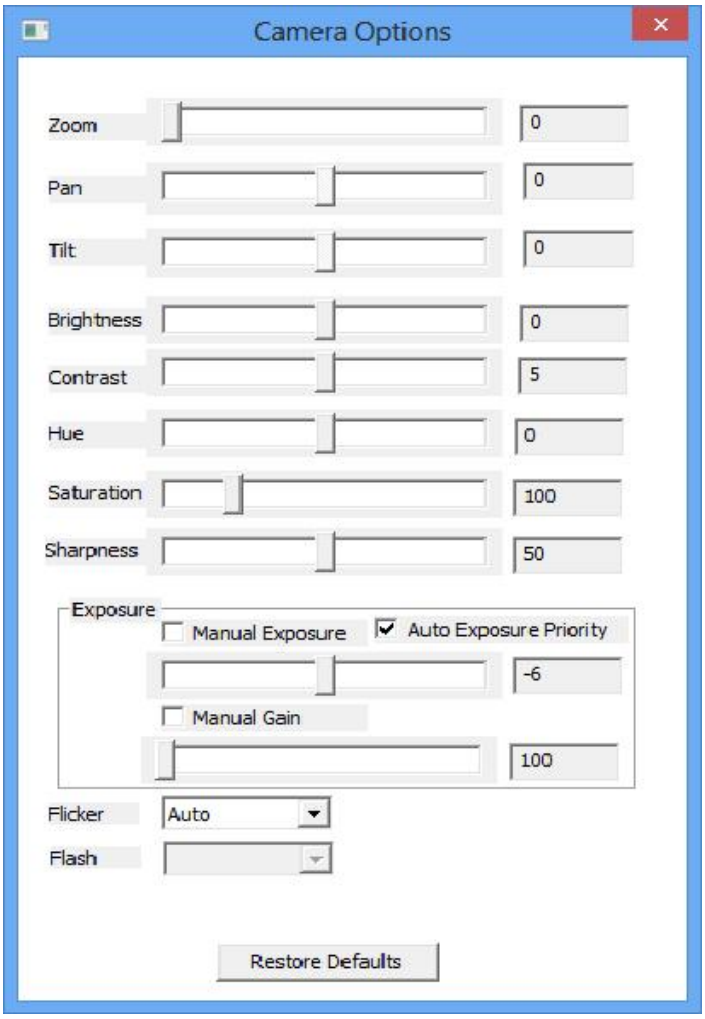
5. Preview gets enabled according to selection of camera mode.



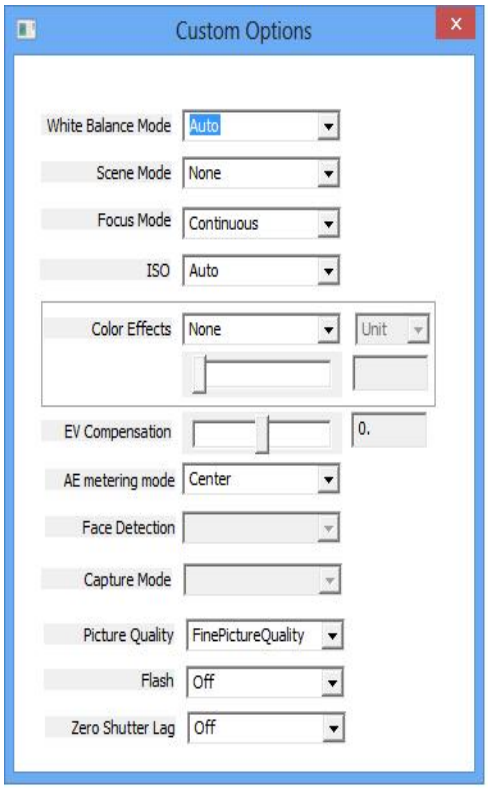
6. Click on the Photo button to capture photo



7. Click on the camera options to change settings like brightness or contrast.



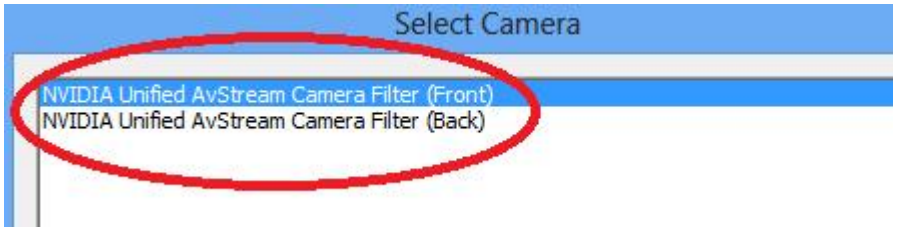
8. Click on the Custom options to change settings



9. After capturing image ,photo is stored in C:\document

4.2 Operations Manual

1. Selection of Camera Mode in Choose Device Dialog Box

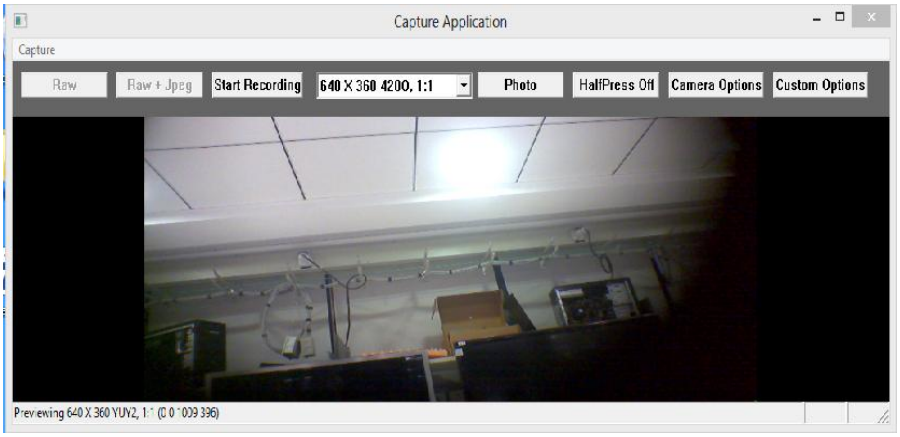


There are two camera modes in choose Device dialog box .

- Front
- Back

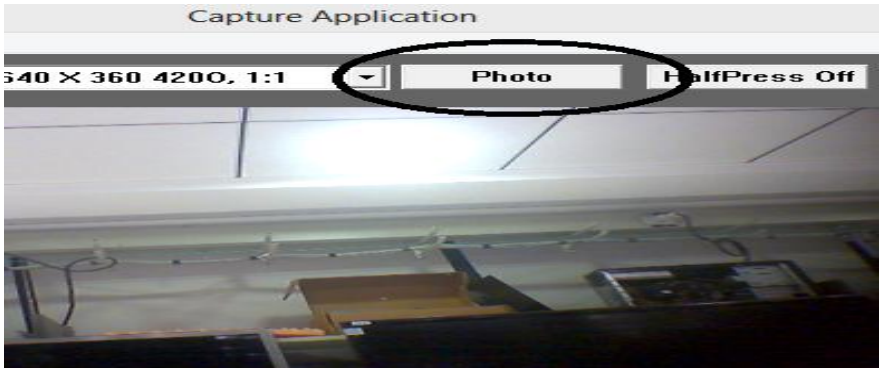
User can select either front camera or back camera.

2.OpeningnvCameraController according to selection of camera mode



According to selection of camera mode by user, Camera Application will be opened with preview (depending on back and front selection) and all other options to work with camera.

3. Photo button to capture image



On tool, there is button named as ‘Photo’ as shown in picture After clicking on this, Image is captured and gets stored immediately in the C:\\documents

4. Camera Options

To change camera settings there is Button named as ‘Camera Options’. After clicking on it, Camera Options dialog box will be opened.

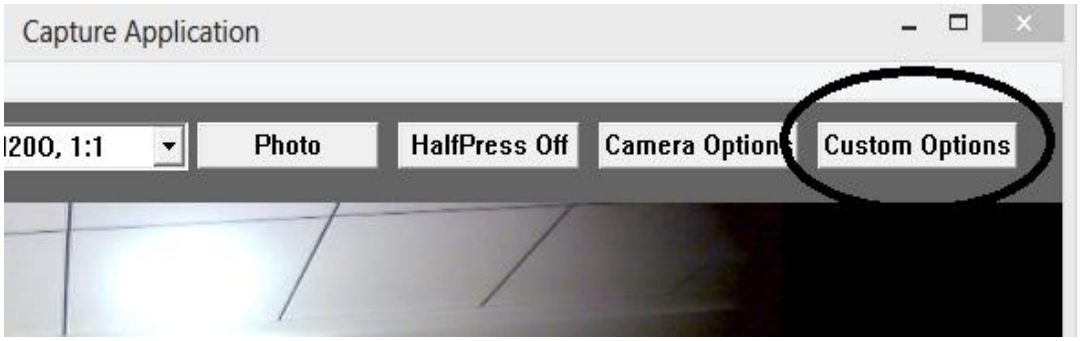
There are various settings which user can select and simultaneously can see effect on the preview.

There are many options available which user can select to change preview

Camera Options
Zoom
Pan
Tilt
Brightness
Contrast
Hue
Saturation
Sharpness
Exposure
Flicker
Flash

5. Custom Options

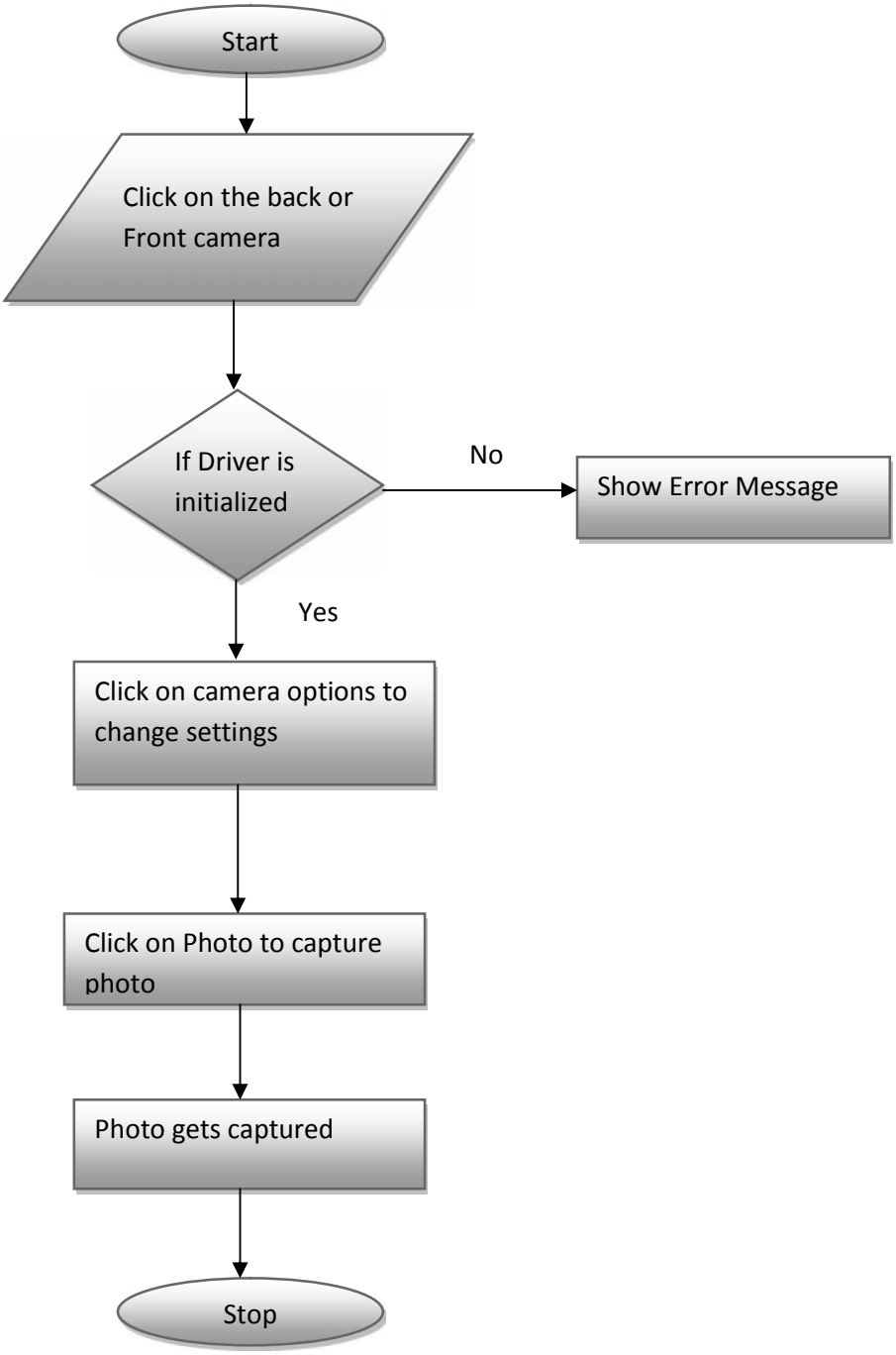
To change camera settings there is Button named as ‘Custom Options’. After clicking on it, Custom Options dialog box will be opened.



There are many options available which user can select to change preview

Custom Options
White Balance Mode
Scene Mode
Focus Mode
Color Effects
EV Compensation
AE metering Mode
Face Detection
Picture Quality
Flash
Zero Shutter Lag

4.3 Flow Chart



Drawbacks and Limitations

- This Tool is programmed in win32 language so this tool is not compatible with Linux, Macintosh, and Unix etc.

- This tool is having Camera Options like Zoom, Brightness, and Contrast etc.

  But if range goes beyond certain limit then preview is not supported to that range.

- We cannot view particular image in that tool itself .We have to see it in the Documents folder in the tablet.

Proposed Enhancements

- This tool is foundation for automation Tool.

  Various Functionalities will be added to this tool which helps to automate camera testing and make easy task for Tester.

- With help of this tool, Tester can test images by applying different combinations of camera Settings and analysis the result.

- On single Click, this tool can be captured multiple photos with different settings like Zoom, Brightness, Contrast, Scene Mode etc.

Conclusions

This Tool is basically foundation for automation. This Camera tool is developed as existing Tablet Camera cannot be modified.

I have been successful enough to conclude that out tool is appropriate to the terms and conditions. And I have tried to complete all functionalities which actual Camera should have like Capturing Photo, different Settings (Basic as well as Custom).

I have tried to make the tool error free and was capable of in notifying each step cautiously.