

Android Camera Manager

Пример приложения, использующего интерфейс Camera1Capturer для обработки видео при захвате с аппаратной или программной камеры

Данный пример показывает различные варианты использования собственного захвата изображения в одном Android приложении. Пример работает с Android SDK, начиная со сборки [1.1.0.42](#)

На всех скриншотах:

- WCS Url - адрес WCS сервера для установки Websocket соединения
- Stream name - имя потока для публикации и воспроизведения
- Camera capturer - выбор примера, реализующего интерфейс Camera1Capturer

Скриншот управления вспышкой:

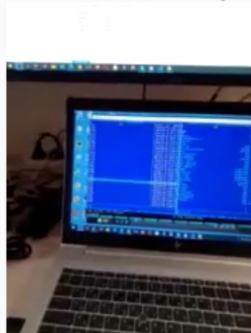
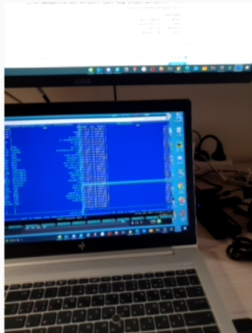
- Turn on flashlight - кнопка включения/отключения вспышки

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PLAYING

WCS Url

wss://demo.flashphoner.com:8443/

Stream name

test

Camera capturer

Flashlight

☐

☒ Use filter

☒ Use PNG overlay

X Position

10

Y position

10

Png width

50

Png height

50

SELECT PNG...

STOP

TURN ON FLASHLIGHT

TURN ON FLASHLIGHT

Скриншот управления масштабом изображения (zoom in/zoom out):

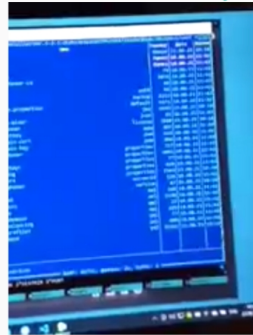
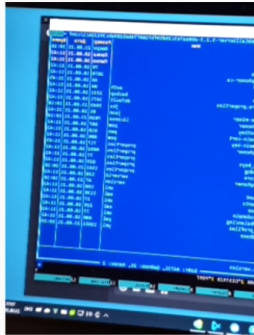
- масштаб регулируется ползунком

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WCS Url

wss://demo.flashphoner.com:8443/

Stream name

test

Camera capturer

Zoom



☒ Use filter

☒ Use PNG overlay

X Position

10

Y position

10

Png width

50

Png height

50

SELECT PNG...

STOP

TURN ON FLASHLIGHT



Скриншот использования GPUImage фильтра 'сепия':

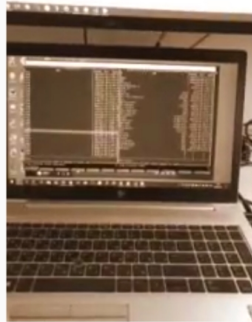
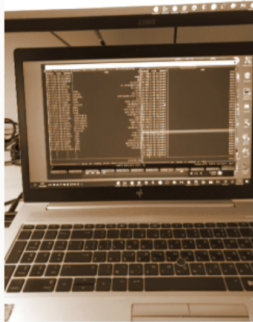
- Use filter - применить фильтр к захватываемому изображению

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WCS Url

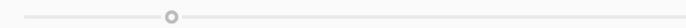
wss://demo.flashphoner.com:8443/

Stream name

test

Camera capturer

GPUImage



☒ Use filter

☒ Use PNG overlay

X Position

10

Y position

10

Png width

50

Png height

50

SELECT PNG...

STOP

TURN ON FLASHLIGHT

TURN ON FLASHLIGHT

Скриншот наложения PNG картинки на изображение:

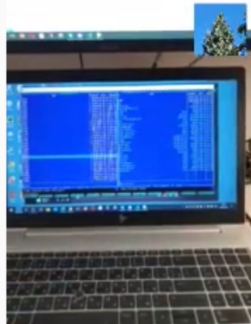
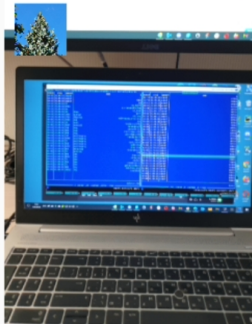
- Select PNG- кнопка выбора файла PNG картинки из галереи устройства
- Use PNG overlay - применить наложение PNG картинки
- X Position, Y position - координаты верхнего левого угла PNG картинки в кадре
- Png width - ширина PNG картинки в кадре в пикселях
- Png height - высота PNG картинки в кадре в пикселях

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93%

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WCS Url

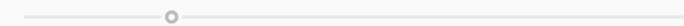
wss://demo.flashphoner.com:8443/

Stream name

test

Camera capturer

PNG overlay



☒ Use filter

☒ Use PNG overlay

X Position

10

Y position

10

Png width

50

Png height

50

SELECT PNG...

STOP

TURN ON FLASHLIGHT



Скриншот выбора разрешения публикации:

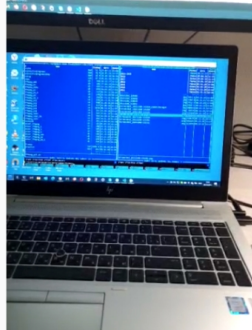
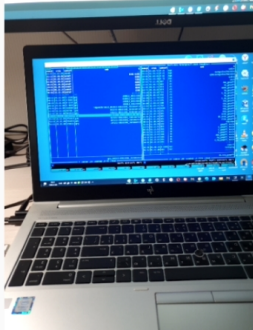
- Camera resolution - селектор выбора разрешения из поддерживаемых камерой

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WCS Url

wss://demo.flashphoner.com:8443/

Stream name

test

Camera capturer

Resolution

Width

640

Height

480

Camera resolution

640x480

☐

☒ Use filter

☒ Use PNG overlay

X Position

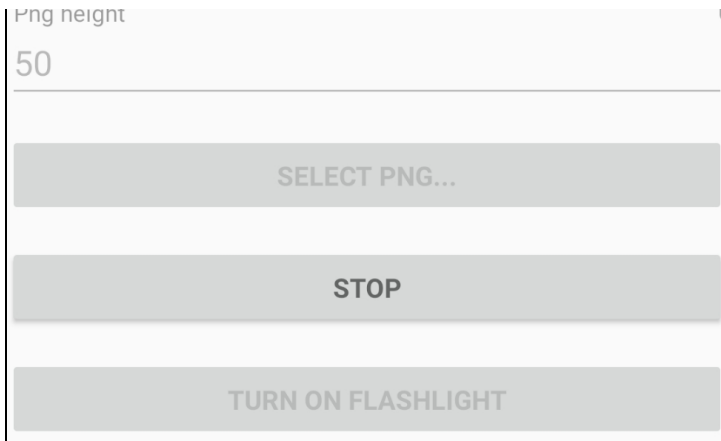
10

Y position

10

Png width

50



Работа с кодом примера

Для разбора кода возьмем следующие классы примера camera-manager, который доступен для скачивания в сборке [1.1.0.47](#):

- класс основной активности приложения [CameraManagerActivity.java](#)
- класс реализации интерфейса Camera1Capturer примера Zoom [ZoomCameraCapturer.java](#)
- класс реализации интерфейса Camera1Enumerator примера Zoom [ZoomCameraEnumerator.java](#)
- класс реализации интерфейса CameraSession примера Zoom [ZoomCameraSession.java](#)
- класс реализации интерфейса Camera1Capturer примера GPUImage [GPUImageCameraCapturer.java](#)
- класс реализации интерфейса Camera1Enumerator примера GPUImage [GPUImageCameraEnumerator.java](#)
- класс реализации интерфейса CameraSession примера GPUImage [GPUImageCameraSession.java](#)
- класс реализации интерфейса Camera1Capturer примера PngOverlay [PngOverlayCameraCapturer.java](#)
- класс реализации интерфейса Camera1Enumerator примера PngOverlay [PngOverlayCameraEnumerator.java](#)
- класс реализации интерфейса CameraSession примера PngOverlay [PngOverlayCameraSession.java](#)
- класс реализации интерфейса Camera1Capturer примера Resolution [ResolutionCameraCapturer.java](#)
- класс реализации интерфейса Camera1Enumerator примера Resolution [ResolutionCameraEnumerator.java](#)
- класс реализации интерфейса CameraSession примера Resolution [ResolutionCameraSession.java](#)

Обратите внимание, что классы реализации интерфейсов помещены в пакет `org.webrtc`, это необходимо для доступа к функциям захвата видео и управления камерой

1. Инициализация API.

`Flashphoner.init()`[code](#)

```
Flashphoner.init(this);
```

2. Создание сессии

`Flashphoner.createSession()`[code](#)

Методу передается объект `SessionOptions` со следующими параметрами

- URL WCS-сервера
- `SurfaceViewRenderer localRenderer`, который будет использоваться для отображения публикуемого потока (после применения изменений)
- `SurfaceViewRenderer remoteRenderer`, который будет использоваться для отображения воспроизводимого потока

```
sessionOptions = new SessionOptions(mWcsUrlView.getText().toString());
sessionOptions.setLocalRenderer(localRender);
sessionOptions.setRemoteRenderer(remoteRender);

/**
 * Session for connection to WCS server is created with method createSession().
 */
session = Flashphoner.createSession(sessionOptions);
```

3. Подключение к серверу.

`Session.connect()`[code](#)

```
session.connect(new Connection());
```

4. Получение от сервера события, подтверждающего успешное соединение.

`session.onConnected()`[code](#)

```
@Override
public void onConnected(final Connection connection) {
    runOnUiThread(new Runnable() {
        @Override
        public void run() {
            mStatusView.setText(connection.getStatus());
            ...
        }
    });
};
```

5. Получение идентификатора тыловой камеры

`Flashphoner.getMediaDevices().getVideoList(),Flashphoner.getCameraEnumerator().isBackFacing()` [code](#)

```
int cameraId = 0;
List<MediaDevice> videoList = Flashphoner.getMediaDevices().getVideoList();
for (MediaDevice videoDevice : videoList) {
    String videoDeviceName = videoDevice.getLabel();
    if (Flashphoner.getCameraEnumerator().isBackFacing(videoDeviceName)) {
        cameraId = videoDevice.getId();
        break;
    }
}
```

6. Настройка ограничений и создание потока

`StreamOptions.setConstraints(),Session.createStream()`[code](#)

```
StreamOptions streamOptions = new StreamOptions(streamName);
VideoConstraints videoConstraints = new VideoConstraints();
videoConstraints.setVideoFps(25);
videoConstraints.setCameraId(cameraId);
Constraints constraints = new Constraints(true, true);
constraints.setVideoConstraints(videoConstraints);
streamOptions.setConstraints(constraints);

/**
 * Stream is created with method Session.createStream().
 */
publishStream = session.createStream(streamOptions);
```

7. Запрос прав на публикацию потока

`ActivityCompat.requestPermissions()`[code](#)

```
@Override
public void onConnected(final Connection connection) {
    runOnUiThread(new Runnable() {
        @Override
        public void run() {
            ...
            ActivityCompat.requestPermissions(StreamingMinActivity.this,
                new String[]{Manifest.permission.RECORD_AUDIO, Manifest.permission.CAMERA},
                PUBLISH_REQUEST_CODE);
            ...
        }
    });
};
```

8. Публикация потока после предоставления соответствующих прав

Stream.publish()[code](#)

```
@Override
public void onRequestPermissionsResult(int requestCode,
                                     @NonNull String permissions[], @NonNull int[] grantResults) {
    switch (requestCode) {
        case PUBLISH_REQUEST_CODE: {
            if (grantResults.length == 0 ||
                grantResults[0] != PackageManager.PERMISSION_GRANTED ||
                grantResults[1] != PackageManager.PERMISSION_GRANTED) {
                muteButton();
                session.disconnect();
                Log.i(TAG, "Permission has been denied by user");
            } else {
                /**
                 * Method Stream.publish() is called to publish stream.
                 */
                publishStream.publish();
                Log.i(TAG, "Permission has been granted by user");
            }
            break;
        }
        ...
    }
}
```

9. Воспроизведение потока после успешной публикации

Session.createStream(), Stream.play()[code](#)

```
publishStream.on(new StreamStatusEvent() {
    @Override
    public void onStreamStatus(final Stream stream, final StreamStatus streamStatus) {
        runOnUiThread(new Runnable() {
            @Override
            public void run() {
                if (StreamStatus.PUBLISHING.equals(streamStatus)) {
                    ...
                    /**
                     * The options for the stream to play are set.
                     * The stream name is passed when StreamOptions object is created.
                     */
                    StreamOptions streamOptions = new StreamOptions(streamName);
                    streamOptions.setConstraints(new Constraints(true, true));

                    /**
                     * Stream is created with method Session.createStream().
                     */
                    playStream = session.createStream(streamOptions);
                    ...
                    /**
                     * Method Stream.play() is called to start playback of the stream.
                     */
                    playStream.play();
                } else {
                    Log.e(TAG, "Can not publish stream " + stream.getName() + " " + streamStatus);
                    onStopped();
                }
                mStatusView.setText(streamStatus.toString());
            }
        });
    }
});
```

10. Закрытие соединения.

Session.disconnect()[code](#)

```

mStartButton.setOnClickListener(new OnClickListener() {
    @Override
    public void onClick(View view) {
        muteButton();
        if (mStartButton.getTag() == null || Integer.valueOf(R.string.action_start).equals(mStartButton.
getTag())) {
            ...
        } else {
            /**
             * Connection to WCS server is closed with method Session.disconnect().
             */
            session.disconnect();
        }
        ...
    }
});

```

11. Получение события, подтверждающего разъединение.

`session.onDisconnection()`[code](#)

```

@Override
public void onDisconnection(final Connection connection) {
    runOnUiThread(new Runnable() {
        @Override
        public void run() {
            mStatusView.setText(connection.getStatus());
            mStatusView.setText(connection.getStatus());
            onStoped();
        }
    });
}

```

12. Выбор примера

[code](#)

```

mCameraCapturer.setOnItemChosenListener(new LabelledSpinner.OnItemChosenListener() {
    @Override
    public void onItemChosen(View labelledSpinner, AdapterView<?> adapterView, View itemView, int
position, long id) {
        String captureType = getResources().getStringArray(R.array.camera_capturer)[position];
        switch (captureType) {
            case "Flashlight":
                changeFlashlightCamera();
                break;
            case "Zoom":
                changeZoomCamera();
                break;
            case "GPUImage":
                changeGpuImageCamera();
                break;
            case "PNG overlay":
                changePngOverlayCamera();
                break;
            case "Resolution":
                changeResolutionCamera();
                break;
        }
    }

    @Override
    public void onNothingChosen(View labelledSpinner, AdapterView<?> adapterView) {
    }
});

```

13. Установка способа захвата камеры и необходимых опций захвата

[code](#)

```
private void changeFlashlightCamera() {
    CameraCapturerFactory.getInstance().setCameraType(CameraCapturerFactory.CameraType.FLASHLIGHT_CAMERA);
    ...
}

private void changeZoomCamera() {
    CameraCapturerFactory.getInstance().setCustomCameraCapturerOptions(zoomCameraCapturerOptions);
    CameraCapturerFactory.getInstance().setCameraType(CameraCapturerFactory.CameraType.CUSTOM);
    ...
}

private void changePngOverlayCamera() {
    CameraCapturerFactory.getInstance().setCustomCameraCapturerOptions(pngOverlayCameraCapturerOptions);
    CameraCapturerFactory.getInstance().setCameraType(CameraCapturerFactory.CameraType.CUSTOM);
    ...
}

private void changeGpuImageCamera() {
    CameraCapturerFactory.getInstance().setCustomCameraCapturerOptions(gpuImageCameraCapturerOptions);
    CameraCapturerFactory.getInstance().setCameraType(CameraCapturerFactory.CameraType.CUSTOM);
    ...
}

private void changeResolutionCamera() {
    CameraCapturerFactory.getInstance().setCustomCameraCapturerOptions(resolutionCameraCapturerOptions);
    CameraCapturerFactory.getInstance().setCameraType(CameraCapturerFactory.CameraType.CUSTOM);
    ...
}
```

14. Настройка опций объекта захвата камеры для примера Zoom

[code](#)

```

private CustomCameraCapturerOptions zoomCameraCapturerOptions = new CustomCameraCapturerOptions() {

    private String cameraName;
    private CameraVideoCapturer.CameraEventsHandler eventsHandler;
    private boolean captureToTexture;

    @Override
    public Class<?>[] getCameraConstructorArgsTypes() {
        return new Class<?>[]{String.class, CameraVideoCapturer.CameraEventsHandler.class, boolean.
class};
    }

    @Override
    public Object[] getCameraConstructorArgs() {
        return new Object[]{cameraName, eventsHandler, captureToTexture};
    }

    @Override
    public void setCameraName(String cameraName) {
        this.cameraName = cameraName;
    }

    @Override
    public void setEventsHandler(CameraVideoCapturer.CameraEventsHandler eventsHandler) {
        this.eventsHandler = eventsHandler;
    }

    @Override
    public void setCaptureToTexture(boolean captureToTexture) {
        this.captureToTexture = captureToTexture;
    }

    @Override
    public String getCameraClassName() {
        return "org.webrtc.ZoomCameraCapturer";
    }

    @Override
    public Class<?>[] getEnumeratorConstructorArgsTypes() {
        return new Class[0];
    }

    @Override
    public Object[] getEnumeratorConstructorArgs() {
        return new Object[0];
    }

    @Override
    public String getEnumeratorClassName() {
        return "org.webrtc.ZoomCameraEnumerator";
    }

};

```

15.Настройка опций объекта захвата камеры для примера PngOverlay

[code](#)

```

private CustomCameraCapturerOptions pngOverlayCameraCapturerOptions = new CustomCameraCapturerOptions() {

    private String cameraName;
    private CameraVideoCapturer.CameraEventsHandler eventsHandler;
    private boolean captureToTexture;

    @Override
    public Class<?>[] getCameraConstructorArgsTypes() {
        return new Class<?>[]{String.class, CameraVideoCapturer.CameraEventsHandler.class, boolean.class};
    }

    @Override
    public Object[] getCameraConstructorArgs() {
        return new Object[]{cameraName, eventsHandler, captureToTexture};
    }

    @Override
    public void setCameraName(String cameraName) {
        this.cameraName = cameraName;
    }

    @Override
    public void setEventsHandler(CameraVideoCapturer.CameraEventsHandler eventsHandler) {
        this.eventsHandler = eventsHandler;
    }

    @Override
    public void setCaptureToTexture(boolean captureToTexture) {
        this.captureToTexture = captureToTexture;
    }

    @Override
    public String getCameraClassName() {
        return "org.webrtc.PngOverlayCameraCapturer";
    }

    @Override
    public Class<?>[] getEnumeratorConstructorArgsTypes() {
        return new Class[0];
    }

    @Override
    public Object[] getEnumeratorConstructorArgs() {
        return new Object[0];
    }

    @Override
    public String getEnumeratorClassName() {
        return "org.webrtc.PngOverlayCameraEnumerator";
    }
};

```

16. Настройка опций объекта захвата камеры для примера GPUImage

[code](#)

```

private CustomCameraCapturerOptions gpuImageCameraCapturerOptions = new CustomCameraCapturerOptions() {

    private String cameraName;
    private CameraVideoCapturer.CameraEventsHandler eventsHandler;
    private boolean captureToTexture;

    @Override
    public Class<?>[] getCameraConstructorArgsTypes() {
        return new Class<?>[]{String.class, CameraVideoCapturer.CameraEventsHandler.class, boolean.class};
    }

    @Override
    public Object[] getCameraConstructorArgs() {
        return new Object[]{cameraName, eventsHandler, captureToTexture};
    }

    @Override
    public void setCameraName(String cameraName) {
        this.cameraName = cameraName;
    }

    @Override
    public void setEventsHandler(CameraVideoCapturer.CameraEventsHandler eventsHandler) {
        this.eventsHandler = eventsHandler;
    }

    @Override
    public void setCaptureToTexture(boolean captureToTexture) {
        this.captureToTexture = captureToTexture;
    }

    @Override
    public String getCameraClassName() {
        return "org.webrtc.GPUImageCameraCapturer";
    }

    @Override
    public Class<?>[] getEnumeratorConstructorArgsTypes() {
        return new Class[0];
    }

    @Override
    public Object[] getEnumeratorConstructorArgs() {
        return new Object[0];
    }

    @Override
    public String getEnumeratorClassName() {
        return "org.webrtc.GPUImageCameraEnumerator";
    }
};

```

17. Настройка опций объекта захвата камеры для примера Resolution

[code](#)

```

private CustomCameraCapturerOptions resolutionCameraCapturerOptions = new CustomCameraCapturerOptions() {

    private String cameraName;
    private CameraVideoCapturer.CameraEventsHandler eventsHandler;
    private boolean captureToTexture;

    @Override
    public Class<?>[] getCameraConstructorArgsTypes() {
        return new Class<?>[]{String.class, CameraVideoCapturer.CameraEventsHandler.class, boolean.class};
    }

    @Override
    public Object[] getCameraConstructorArgs() {
        return new Object[]{cameraName, eventsHandler, captureToTexture};
    }

    @Override
    public void setCameraName(String cameraName) {
        this.cameraName = cameraName;
    }

    @Override
    public void setEventsHandler(CameraVideoCapturer.CameraEventsHandler eventsHandler) {
        this.eventsHandler = eventsHandler;
    }

    @Override
    public void setCaptureToTexture(boolean captureToTexture) {
        this.captureToTexture = captureToTexture;
    }

    @Override
    public String getCameraClassName() {
        return "org.webrtc.ResolutionCameraCapturer";
    }

    @Override
    public Class<?>[] getEnumeratorConstructorArgsTypes() {
        return new Class[0];
    }

    @Override
    public Object[] getEnumeratorConstructorArgs() {
        return new Object[0];
    }

    @Override
    public String getEnumeratorClassName() {
        return "org.webrtc.ResolutionCameraEnumerator";
    }
};

```

18. Включение вспышки

Flashphoner.turnOnFlashlight() [code](#)

```

private void turnOnFlashlight() {
    if (Flashphoner.turnOnFlashlight()) {
        mSwitchFlashlightButton.setText(getResources().getString(R.string.turn_off_flashlight));
        flashlight = true;
    }
}

```

19. Отключение вспышки

Flashphoner.turnOffFlashlight() [code](#)

```
private void turnOffFlashlight() {
    Flashphoner.turnOffFlashlight();
    mSwitchFlashlightButton.setText(getResources().getString(R.string.turn_on_flashlight));
    flashlight = false;
}
```

20. Управление масштабом при помощи ползунка

ZoomCameraCapturer.setZoom() [code](#)

```
mZoomSeekBar.setOnSeekBarChangeListener(new SeekBar.OnSeekBarChangeListener() {
    @Override
    public void onProgressChanged(SeekBar seekBar, int progress, boolean fromUser) {
        CameraVideoCapturer cameraVideoCapturer = CameraCapturerFactory.getInstance().
getCameraVideoCapturer();
        if (cameraVideoCapturer instanceof ZoomCameraCapturer) {
            ((ZoomCameraCapturer) cameraVideoCapturer).setZoom(progress);
        }
        ...
    }
});
```

21. Добавление картинки в поток с запросом прав

PngOverlayCameraCapturer.setPicture() [code](#)

```
@Override
protected void onActivityResult(int requestCode, int resultCode, @Nullable Intent data) {
    super.onActivityResult(requestCode, resultCode, data);

    if (requestCode == REQUEST_IMAGE_CAPTURE && resultCode == RESULT_OK) {
        InputStream inputStream = null;
        try {
            inputStream = CameraManagerActivity.this.getBaseContext().getContentResolver().openInputStream
(data.getData());
        } catch (FileNotFoundException e) {
            Log.e(TAG, "Can't select picture: " + e.getMessage());
        }
        picture = BitmapFactory.decodeStream(inputStream);
    }

    CameraVideoCapturer cameraVideoCapturer = CameraCapturerFactory.getInstance().getCameraVideoCapturer();
    if (cameraVideoCapturer instanceof PngOverlayCameraCapturer && picture != null) {
        ((PngOverlayCameraCapturer) cameraVideoCapturer).setPicture(picture);
    }
}
```

22. Установка выбранного разрешения публикации

[code](#)

```

mCameraResolutionSpinner = (LabelledSpinner) findViewById(R.id.camera_resolution_spinner);
mCameraResolutionSpinner.setOnItemClickListener(new LabelledSpinner.OnItemClickListener() {

    @Override
    public void onItemClick(View labelledSpinner, AdapterView<?> adapterView, View itemView, int position,
long id) {
        String resolution = adapterView.getSelectedItem().toString();
        if (resolution.isEmpty()) {
            return;
        }
        setResolutions(resolution);
    }

    @Override
    public void onNothingChosen(View labelledSpinner, AdapterView<?> adapterView) {

    }

});

...
private void setResolutions(String resolutionStr) {
    String[] resolution = resolutionStr.split("x");
    mWidth.setText(resolution[0]);
    mHeight.setText(resolution[1]);
}

```

23. Создание сессии камеры в классе ZoomCameraCapturer

CameraSession.create() [code](#)

```

@Override
protected void createCameraSession(CameraSession.CreateSessionCallback createSessionCallback, CameraSession.
Events events, Context applicationContext, SurfaceTextureHelper surfaceTextureHelper, String cameraName, int
width, int height, int framerate) {
    CameraSession.CreateSessionCallback myCallback = new CameraSession.CreateSessionCallback() {
        @Override
        public void onDone(CameraSession cameraSession) {
            ZoomCameraCapturer.this.cameraSession = (ZoomCameraSession) cameraSession;
            createSessionCallback.onDone(cameraSession);
        }

        @Override
        public void onFailure(CameraSession.FailureType failureType, String s) {
            createSessionCallback.onFailure(failureType, s);
        }
    };

    ZoomCameraSession.create(myCallback, events, captureToTexture, applicationContext,
surfaceTextureHelper, Camera1Enumerator.getCameraIndex(cameraName), width, height, framerate);
}

```

24. Изменение масштаба в классе ZoomCameraCapturer

CameraSession.setZoom() [code](#)

```

public boolean setZoom(int value) {
    return cameraSession.setZoom(value);
}

```

25. Выделение буфера для захвата камеры в классе ZoomCameraSession

[code](#)

```

        if (!captureToTexture) {
            int frameSize = captureFormat.frameSize();

            //The implementation is taken from the WebRTC library, so the purpose of the three buffers is
not entirely known
            for(int i = 0; i < 3; ++i) {
                ByteBuffer buffer = ByteBuffer.allocateDirect(frameSize);
                camera.addCallbackBuffer(buffer.array());
            }
        }

```

26. Реализация изменение масштаба в классе ZoomCameraSession

[code](#)

```

public boolean setZoom(int value) {
    if (!isCameraActive() && camera.getParameters().isZoomSupported()) {
        return false;
    }

    Camera.Parameters parameters = camera.getParameters();
    parameters.setZoom(value);
    camera.setParameters(parameters);
    return true;
}

```

27. Установка использования фильтра в классе GPUImageCameraSession

[code](#)

```

public void setUsedFilter(boolean usedFilter) {
    isUsedFilter = usedFilter;
}

```

28. Применение фильтра к данным из буфера камеры

[code](#)

```

private void listenForByteBufferFrames() {
    this.camera.setPreviewCallbackWithBuffer(new Camera.PreviewCallback() {
        public void onPreviewFrame(byte[] data, Camera callbackCamera) {
            GPUImageCameraSession.this.checkIsOnCameraThread();
            if (callbackCamera != GPUImageCameraSession.this.camera) {
                Logging.e(TAG, CALLBACK_FROM_A_DIFFERENT_CAMERA_THIS_SHOULD_NEVER_HAPPEN);
            } else if (GPUImageCameraSession.this.state != GPUImageCameraSession.SessionState.RUNNING) {
                Logging.d(TAG, BYTEBUFFER_FRAME_CAPTURED_BUT_CAMERA_IS_NO_LONGER_RUNNING);
            } else {
                ...
                applyFilter(data, GPUImageCameraSession.this.captureFormat.width, GPUImageCameraSession.
this.captureFormat.height);

                VideoFrame.Buffer frameBuffer = new NV21Buffer(data, GPUImageCameraSession.this.
captureFormat.width, GPUImageCameraSession.this.captureFormat.height, () -> {
                    GPUImageCameraSession.this.cameraThreadHandler.post(() -> {
                        if (GPUImageCameraSession.this.state == GPUImageCameraSession.SessionState.RUNNING)
{
                            GPUImageCameraSession.this.camera.addCallbackBuffer(data);
                        }
                    });
                });
                VideoFrame frame = new VideoFrame(frameBuffer, GPUImageCameraSession.this.
getFrameOrientation(), captureTimeNs);
                GPUImageCameraSession.this.events.onFrameCaptured(GPUImageCameraSession.this, frame);
                frame.release();
            }
        }
    });
}
}

```

29. Реализация фильтра

[code](#)

```

private void initFilter(int width, int height) {
    filter = new GPUImageMonochromeFilter();
    filter.setColor(0,0,0);

    renderer = new GPUImageRenderer(filter);
    renderer.setRotation(Rotation.NORMAL, false, false);
    renderer.setScaleType(GPUImage.ScaleType.CENTER_INSIDE);

    buffer = new PixelBuffer(width, height);
    buffer.setRenderer(renderer);
}

private void destroyFilter() {
    filter.destroy();
    buffer.destroy();
}

private void applyFilter(byte[] data, int width, int height) {
    if (!isUsedFilter) {
        return;
    }

    renderer.onPreviewFrame(data, width, height);
    Bitmap newBitmapRgb = buffer.getBitmap();
    byte[] dataYuv = Utils.getNV21(width, height, newBitmapRgb);
    System.arraycopy(dataYuv, 0, data, 0, dataYuv.length);
}

```

30. Установка картинки для наложения в классе PngOverlayCameraCapturer

[code](#)

```

public void setPicture(Bitmap picture) {
    if (cameraSession != null) {
        cameraSession.setPicture(picture);
    }
}

```

31. Наложение данных картинки на данные из буфера камеры

[code](#)

```

private void listenForByteBufferFrames() {
    this.camera.setPreviewCallbackWithBuffer(new Camera.PreviewCallback() {
        public void onPreviewFrame(byte[] data, Camera callbackCamera) {
            PngOverlayCameraSession.this.checkIsOnCameraThread();
            if (callbackCamera != PngOverlayCameraSession.this.camera) {
                Logging.e(TAG, CALLBACK_FROM_A_DIFFERENT_CAMERA_THIS_SHOULD_NEVER_HAPPEN);
            } else if (PngOverlayCameraSession.this.state != PngOverlayCameraSession.SessionState.RUNNING) {
                Logging.d(TAG, BYTEBUFFER_FRAME_CAPTURED_BUT_CAMERA_IS_NO_LONGER_RUNNING);
            } else {
                ...
                insertPicture(data, PngOverlayCameraSession.this.captureFormat.width,
PngOverlayCameraSession.this.captureFormat.height);

                VideoFrame.Buffer frameBuffer = new NV21Buffer(data, PngOverlayCameraSession.this.
captureFormat.width, PngOverlayCameraSession.this.captureFormat.height, () -> {
                    PngOverlayCameraSession.this.cameraThreadHandler.post(() -> {
                        if (PngOverlayCameraSession.this.state == PngOverlayCameraSession.SessionState.
RUNNING) {
                            PngOverlayCameraSession.this.camera.addCallbackBuffer(data);
                        }
                    });
                });
                VideoFrame frame = new VideoFrame(frameBuffer, PngOverlayCameraSession.this.
getFrameOrientation(), captureTimeNs);
                PngOverlayCameraSession.this.events.onFrameCaptured(PngOverlayCameraSession.this, frame);
                frame.release();
            }
        }
    });
}

```

32. Реализация наложения картинки

[code](#)

```

private void insertPicture(byte[] data, int width, int height) {
    if (picture == null || !isUsedPngOverlay) {
        return;
    }

    Bitmap scaledPicture = rescalingPicture();

    int [] pngArray = new int[scaledPicture.getHeight() * scaledPicture.getWidth()];
    scaledPicture.getPixels(pngArray, 0, scaledPicture.getWidth(), 0, 0, scaledPicture.getWidth(),
scaledPicture.getHeight());

    int [] rgbData = new int [width * height];
    GPUImageNativeLibrary.YUVtoARBG(data, width, height, rgbData);

    int pictureW = scaledPicture.getWidth();
    int pictureH = scaledPicture.getHeight();

    for (int c = 0; c < pngArray.length; c++) {
        int pictureColumn = c / pictureW;
        int pictureLine = c - pictureColumn * pictureW;
        int index = (pictureLine * width) + pictureColumn + startX * width + startY;

        if (index >= data.length) {
            break;
        }
        rgbData[index] = pngArray[c];
    }

    byte[] yuvData = Utils.getNV21(width, height, rgbData);
    System.arraycopy(yuvData, 0, data, 0, yuvData.length);
}

```

33. Получение списка поддерживаемых разрешений

ResolutionCameraCapturer.getSupportedResolutions [code](#)

```

public List<Camera.Size> getSupportedResolutions() {
    Camera camera = Camera.open(Camera1Enumerator.getCameraIndex(cameraName));
    List ret = Collections.EMPTY_LIST;
    if (camera != null) {
        ret = camera.getParameters().getSupportedVideoSizes();
        camera.release();
    }

    return ret;
}

```