**МИНИСТЕРСТВО ОБРАЗОВАНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ**

**УЧРЕЖДЕНИЕ ОБРАЗОВАНИЯ**

**ГОМЕЛЬСКИЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ**

**УНИВЕРСИТЕТ ИМЕНИ П. О. СУХОГО**

Факультет автоматизированных и информационных систем

Кафедра «Информационные технологии»

ЛАБОРАТОРНАЯ РАБОТА №6

по дисциплине: **«Программирование мобильных информационных систем»**

на тему: **«Фоновые задачи и службы»**

Выполнил: студент группы ИТП-31

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Проверил ст. преподаватель:

Стефановский И.Л.

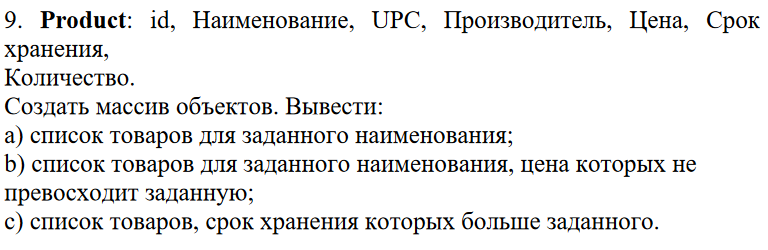
Гомель 2024

**Цель работы**: изучить программирование фоновых задач и служб в Android.

**Задание:**

Добавить в приложение, разработанное в лабораторной работе №4 фоновую службу, выполняющее периодическое сохранение данных приложения в файл. Выполнить запуск приложения на эмуляторе

Вариант задания представлен на рисунке 1.

Рисунок 1 – вариант задания

**Ход выполнения и результаты работы:**

На рисунке 2 представлено использование асинхронной задачи.

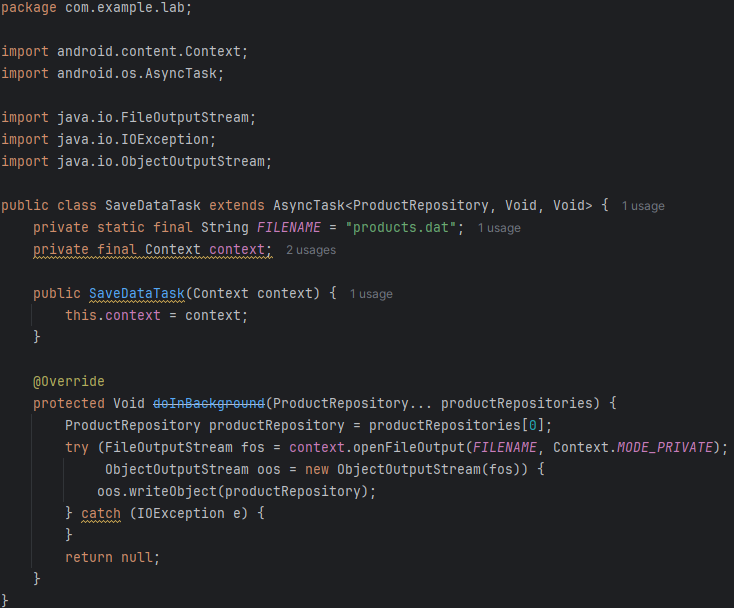


Рисунок 2 – использование асинхронной задачи

На рисунке 3 представлено использование асинхронной задачи в основной *activity*.

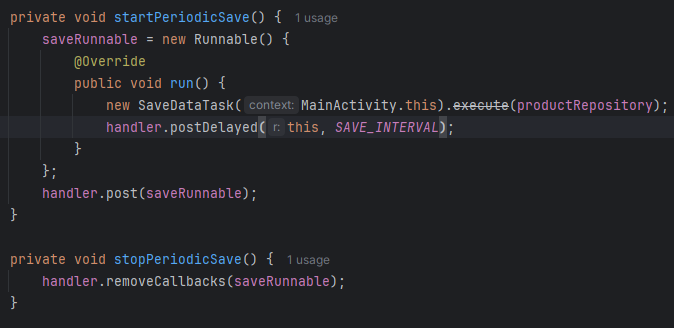


Рисунок 3 – использование асинхронной задачи в основной *activity*

Текст *MainActivity.java* представлен в приложении А.

Текст *EditProductActivity.java* представлен в приложении Б.

Текст *Product.java* представлен в приложении В.

Текст *ProductRepository.java* представлен в приложении Г.

Текст *activity\_main.xml* представлен в приложении Д.

Текст *activity\_edit\_product.xml* представлен в приложении Е.

Текст *SaveDataTask.java* представлен в приложении Ё.

**Вывод:** в ходе выполнения лабораторной работы изучено программирование фоновых задач и служб в Android.

**ПРИЛОЖЕНИЕ А**

(обязательное)

**Текст *MainActivity***

package com.example.lab;

import android.content.Context;

import android.content.Intent;

import android.os.Bundle;

import android.os.Handler;

import android.view.View;

import android.widget.AdapterView;

import android.widget.ArrayAdapter;

import android.widget.EditText;

import android.widget.ListView;

import androidx.appcompat.app.AppCompatActivity;

import java.io.FileInputStream;

import java.io.FileOutputStream;

import java.io.IOException;

import java.io.ObjectInputStream;

import java.io.ObjectOutputStream;

import java.util.List;

public class MainActivity extends AppCompatActivity {

private static final String FILENAME = "products.dat";

private static final long SAVE\_INTERVAL = 1000;

private ProductRepository productRepository;

private ListView listView;

private EditText filterName, filterPrice, filterShelfLife;

private Handler handler;

private Runnable saveRunnable;

@Override

protected void onCreate(Bundle savedInstanceState) {

loadProductsFromFile();

super.onCreate(savedInstanceState);

setContentView(R.layout.activity\_main);

handler = new Handler();

startPeriodicSave();

listView = findViewById(R.id.product\_list);

filterName = findViewById(R.id.filter\_name);

filterPrice = findViewById(R.id.filter\_price);

filterShelfLife = findViewById(R.id.filter\_shelf\_life);

showProducts(productRepository.products);

listView.setOnItemClickListener(new AdapterView.OnItemClickListener() {

@Override

public void onItemClick(AdapterView<?> parent, View view, int position, long id) {

Product selectedProduct = (Product) listView.getAdapter().getItem(position);

Intent intent = new Intent(MainActivity.this, EditProductActivity.class);

intent.putExtra("selectedProduct", selectedProduct);

startActivityForResult(intent, 1);

}

});

}

private void startPeriodicSave() {

saveRunnable = new Runnable() {

@Override

public void run() {

new SaveDataTask(MainActivity.this).execute(productRepository);

handler.postDelayed(this, SAVE\_INTERVAL);

}

};

handler.post(saveRunnable);

}

private void stopPeriodicSave() {

handler.removeCallbacks(saveRunnable);

}

@Override

protected void onDestroy() {

super.onDestroy();

saveProductsToFile();

stopPeriodicSave();

}

private void loadProductsFromFile() {

try (FileInputStream fis = openFileInput(FILENAME);

ObjectInputStream ois = new ObjectInputStream(fis)) {

productRepository = (ProductRepository) ois.readObject();

} catch (IOException | ClassNotFoundException e) {

productRepository = new ProductRepository();

}

}

private void saveProductsToFile() {

try (FileOutputStream fos = openFileOutput(FILENAME, Context.MODE\_PRIVATE);

ObjectOutputStream oos = new ObjectOutputStream(fos)) {

oos.writeObject(productRepository);

} catch (IOException e) {

}

}

private void showProducts(List<Product> products) {

ArrayAdapter<Product> adapter = new ArrayAdapter<>(this, android.R.layout.simple\_list\_item\_1, products);

listView.setAdapter(adapter);

}

public void filterByName(View view) {

String name = filterName.getText().toString();

showProducts(productRepository.getProductsByName(name));

}

public void filterByNameAndPrice(View view) {

String name = filterName.getText().toString();

double price = Double.parseDouble(filterPrice.getText().toString());

showProducts(productRepository.getProductsByNameAndPrice(name, price));

}

public void filterByShelfLife(View view) {

int shelfLife = Integer.parseInt(filterShelfLife.getText().toString());

showProducts(productRepository.getProductsByShelfLife(shelfLife));

}

@Override

protected void onActivityResult(int requestCode, int resultCode, Intent data) {

super.onActivityResult(requestCode, resultCode, data);

if (requestCode == 1 && resultCode == RESULT\_OK) {

Product updatedProduct = (Product) data.getSerializableExtra("updatedProduct");

if (updatedProduct != null) {

productRepository.updateProduct(updatedProduct);

showProducts(productRepository.products);

}

}

}

}

**ПРИЛОЖЕНИЕ Б**

(обязательное)

**Текст *EditProductActivity***

package com.example.lab;

import android.content.Intent;

import android.os.Bundle;

import android.view.View;

import android.widget.EditText;

import androidx.appcompat.app.AppCompatActivity;

public class EditProductActivity extends AppCompatActivity {

private Product selectedProduct;

private EditText nameField, upcField, manufacturerField, priceField, shelfLifeField, quantityField;

@Override

protected void onCreate(Bundle savedInstanceState) {

super.onCreate(savedInstanceState);

setContentView(R.layout.activity\_edit\_product);

selectedProduct = (Product) getIntent().getSerializableExtra("selectedProduct");

nameField = findViewById(R.id.edit\_name);

upcField = findViewById(R.id.edit\_upc);

manufacturerField = findViewById(R.id.edit\_manufacturer);

priceField = findViewById(R.id.edit\_price);

shelfLifeField = findViewById(R.id.edit\_shelf\_life);

quantityField = findViewById(R.id.edit\_quantity);

if (selectedProduct != null) {

nameField.setText(selectedProduct.name);

upcField.setText(selectedProduct.upc);

manufacturerField.setText(selectedProduct.manufacturer);

priceField.setText(String.valueOf(selectedProduct.price));

shelfLifeField.setText(String.valueOf(selectedProduct.shelfLife));

quantityField.setText(String.valueOf(selectedProduct.quantity));

}

}

public void saveProduct(View view) {

if (selectedProduct != null) {

selectedProduct.name = nameField.getText().toString();

selectedProduct.upc = upcField.getText().toString();

selectedProduct.manufacturer = manufacturerField.getText().toString();

selectedProduct.price = Double.parseDouble(priceField.getText().toString());

selectedProduct.shelfLife = Integer.parseInt(shelfLifeField.getText().toString());

selectedProduct.quantity = Integer.parseInt(quantityField.getText().toString());

Intent resultIntent = new Intent();

resultIntent.putExtra("updatedProduct", selectedProduct);

setResult(RESULT\_OK, resultIntent);

}

finish();

}

}

**ПРИЛОЖЕНИЕ В**

(обязательное)

**Текст *Product***

package com.example.lab;

import java.io.Serializable;

public class Product implements Serializable {

public int id;

public String name;

public String upc;

public String manufacturer;

public double price;

public int shelfLife;

public int quantity;

public Product(int id, String name, String upc, String manufacturer, double price, int shelfLife, int quantity) {

this.id = id;

this.name = name;

this.upc = upc;

this.manufacturer = manufacturer;

this.price = price;

this.shelfLife = shelfLife;

this.quantity = quantity;

}

@Override

public String toString() {

return name;

}

}

**ПРИЛОЖЕНИЕ Г**

(обязательное)

**Текст *ProductRepository***

package com.example.lab;

import java.util.ArrayList;

import java.util.List;

public class ProductRepository {

public List<Product> products;

public ProductRepository() {

products = new ArrayList<>();

products.add(new Product(1, "Product1", "12345", "Manufacturer1", 100.0, 30, 10));

products.add(new Product(2, "Product2", "67890", "Manufacturer2", 150.0, 60, 5));

products.add(new Product(3, "Product3", "54321", "Manufacturer1", 200.0, 20, 2));

}

// Фильтрация по наименованию

public List<Product> getProductsByName(String name) {

List<Product> result = new ArrayList<>();

for (Product product : products) {

if (product.name.equalsIgnoreCase(name)) {

result.add(product);

}

}

return result;

}

// Фильтрация по наименованию и цене

public List<Product> getProductsByNameAndPrice(String name, double maxPrice) {

List<Product> result = new ArrayList<>();

for (Product product : products) {

if (product.name.equalsIgnoreCase(name) && product.price <= maxPrice) {

result.add(product);

}

}

return result;

}

// Фильтрация по сроку хранения

public List<Product> getProductsByShelfLife(int minShelfLife) {

List<Product> result = new ArrayList<>();

for (Product product : products) {

if (product.shelfLife > minShelfLife) {

result.add(product);

}

}

return result;

}

public Product findProductById(int id) {

for (Product product : products) {

if (product.id == id) {

return product;

}

}

return null;

}

// Обновление продукта

public void updateProduct(Product updatedProduct) {

for (int i = 0; i < products.size(); i++) {

if (products.get(i).id == updatedProduct.id) {

products.set(i, updatedProduct);

break;

}

}

}

}

**ПРИЛОЖЕНИЕ Д**

(обязательное)

**Текст *activity\_main.xml***

<?xml version="1.0" encoding="utf-8"?>

<androidx.constraintlayout.widget.ConstraintLayout xmlns:android="http://schemas.android.com/apk/res/android"

xmlns:app="http://schemas.android.com/apk/res-auto"

xmlns:tools="http://schemas.android.com/tools"

android:id="@+id/main"

android:layout\_width="match\_parent"

android:layout\_height="match\_parent"

tools:context=".MainActivity">

<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"

android:orientation="vertical"

android:layout\_width="match\_parent"

android:layout\_height="match\_parent">

<EditText

android:id="@+id/filter\_name"

android:layout\_width="match\_parent"

android:layout\_height="wrap\_content"

android:hint="Enter product name" />

<EditText

android:id="@+id/filter\_price"

android:layout\_width="match\_parent"

android:layout\_height="wrap\_content"

android:hint="Enter max price" />

<EditText

android:id="@+id/filter\_shelf\_life"

android:layout\_width="match\_parent"

android:layout\_height="wrap\_content"

android:hint="Enter min shelf life" />

<Button

android:layout\_width="match\_parent"

android:layout\_height="wrap\_content"

android:onClick="filterByName"

android:text="Filter by Name" />

<Button

android:layout\_width="match\_parent"

android:layout\_height="wrap\_content"

android:onClick="filterByNameAndPrice"

android:text="Filter by Name and Price" />

<Button

android:layout\_width="match\_parent"

android:layout\_height="wrap\_content"

android:onClick="filterByShelfLife"

android:text="Filter by Shelf Life" />

<ListView

android:id="@+id/product\_list"

android:layout\_width="match\_parent"

android:layout\_height="wrap\_content" />

</LinearLayout>

</androidx.constraintlayout.widget.ConstraintLayout>

**ПРИЛОЖЕНИЕ Е**

(обязательное)

**Текст *activity\_edit\_product.xml***

<?xml version="1.0" encoding="utf-8"?>

<androidx.constraintlayout.widget.ConstraintLayout xmlns:android="http://schemas.android.com/apk/res/android"

android:layout\_width="match\_parent"

android:layout\_height="match\_parent"

xmlns:app="http://schemas.android.com/apk/res-auto">

<EditText

android:id="@+id/edit\_name"

android:layout\_width="0dp"

android:layout\_height="wrap\_content"

android:hint="Product Name"

android:minHeight="48dp"

android:padding="12dp"

app:layout\_constraintTop\_toTopOf="parent"

app:layout\_constraintStart\_toStartOf="parent"

app:layout\_constraintEnd\_toEndOf="parent"

android:layout\_marginTop="16dp"

android:layout\_marginStart="16dp"

android:layout\_marginEnd="16dp" />

<EditText

android:id="@+id/edit\_upc"

android:layout\_width="0dp"

android:layout\_height="wrap\_content"

android:hint="UPC"

android:minHeight="48dp"

android:padding="12dp"

app:layout\_constraintTop\_toBottomOf="@id/edit\_name"

app:layout\_constraintStart\_toStartOf="parent"

app:layout\_constraintEnd\_toEndOf="parent"

android:layout\_marginTop="16dp"

android:layout\_marginStart="16dp"

android:layout\_marginEnd="16dp" />

<EditText

android:id="@+id/edit\_manufacturer"

android:layout\_width="0dp"

android:layout\_height="wrap\_content"

android:hint="Manufacturer"

android:minHeight="48dp"

android:padding="12dp"

app:layout\_constraintTop\_toBottomOf="@id/edit\_upc"

app:layout\_constraintStart\_toStartOf="parent"

app:layout\_constraintEnd\_toEndOf="parent"

android:layout\_marginTop="16dp"

android:layout\_marginStart="16dp"

android:layout\_marginEnd="16dp" />

<EditText

android:id="@+id/edit\_price"

android:layout\_width="0dp"

android:layout\_height="wrap\_content"

android:hint="Price"

android:minHeight="48dp"

android:padding="12dp"

app:layout\_constraintTop\_toBottomOf="@id/edit\_manufacturer"

app:layout\_constraintStart\_toStartOf="parent"

app:layout\_constraintEnd\_toEndOf="parent"

android:layout\_marginTop="16dp"

android:layout\_marginStart="16dp"

android:layout\_marginEnd="16dp" />

<EditText

android:id="@+id/edit\_shelf\_life"

android:layout\_width="0dp"

android:layout\_height="wrap\_content"

android:hint="Shelf Life"

android:minHeight="48dp"

android:padding="12dp"

app:layout\_constraintTop\_toBottomOf="@id/edit\_price"

app:layout\_constraintStart\_toStartOf="parent"

app:layout\_constraintEnd\_toEndOf="parent"

android:layout\_marginTop="16dp"

android:layout\_marginStart="16dp"

android:layout\_marginEnd="16dp" />

<EditText

android:id="@+id/edit\_quantity"

android:layout\_width="0dp"

android:layout\_height="wrap\_content"

android:hint="Quantity"

android:minHeight="48dp"

android:padding="12dp"

app:layout\_constraintTop\_toBottomOf="@id/edit\_shelf\_life"

app:layout\_constraintStart\_toStartOf="parent"

app:layout\_constraintEnd\_toEndOf="parent"

android:layout\_marginTop="16dp"

android:layout\_marginStart="16dp"

android:layout\_marginEnd="16dp" />

<Button

android:layout\_width="0dp"

android:layout\_height="wrap\_content"

android:onClick="saveProduct"

android:text="Save"

app:layout\_constraintTop\_toBottomOf="@id/edit\_quantity"

app:layout\_constraintStart\_toStartOf="parent"

app:layout\_constraintEnd\_toEndOf="parent"

android:layout\_marginTop="16dp"

android:layout\_marginStart="16dp"

android:layout\_marginEnd="16dp" />

</androidx.constraintlayout.widget.ConstraintLayout>

**ПРИЛОЖЕНИЕ Ё**

(обязательное)

**Текст *SaveDataTask.java***

package com.example.lab;

import android.content.Context;

import android.os.AsyncTask;

import java.io.FileOutputStream;

import java.io.IOException;

import java.io.ObjectOutputStream;

public class SaveDataTask extends AsyncTask<ProductRepository, Void, Void> {

private static final String FILENAME = "products.dat";

private final Context context;

public SaveDataTask(Context context) {

this.context = context;

}

@Override

protected Void doInBackground(ProductRepository... productRepositories) {

ProductRepository productRepository = productRepositories[0];

try (FileOutputStream fos = context.openFileOutput(FILENAME, Context.MODE\_PRIVATE);

ObjectOutputStream oos = new ObjectOutputStream(fos)) {

oos.writeObject(productRepository);

} catch (IOException e) {

}

return null;

}

}