

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ
РОССИЙСКОЙ ФЕДЕРАЦИИ

ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ ОБРАЗОВАТЕЛЬНОЕ
УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ

**«БЕЛГОРОДСКИЙ ГОСУДАРСТВЕННЫЙ
ТЕХНОЛОГИЧЕСКИЙ УНИВЕРСИТЕТ им. В. Г.
ШУХОВА» (БГТУ им. В.Г. Шухова)**

Кафедра программного обеспечения вычислительной техники и автоматизированных систем

Лабораторная работа №7

по дисциплине: Базы данных

тема: «Организация взаимодействия с базой данных через приложение, использующее технологию ORM»

Выполнил: ст. группы ПВ-223
Дмитриев Андрей Александрович

Проверил:
Панченко Максим Владимирович

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Вариант 2.

Цель работы: разработать приложение, использующее технологию ORM, для взаимодействия с базой данных.

Задание к работе:

1. Изучить библиотеку для реализации приложения с графическим интерфейсом на выбранном языке программирования.
2. Разработать приложение с графическим интерфейсом, которое обеспечит подключение к базе данных, разработанной на основе предыдущих лабораторных работ, а также обеспечит выполнение запросов.

Ход работы:

Приложение с графическим интерфейсом реализовано с использованием библиотеки android-compose. Как СУБД используется SQLite в место PostgreSQL из-за наличия сложностей в установке соединения. Как ORM используется Room, классическая библиотека от Google.

Полный код находится по ссылке:

<https://github.com/AnDreV133/SimpleStore/tree/master-lab7>.

Некоторые части исходного кода с пояснениями:

Соединение с базой данных:

```
private var appDb: AppDatabase? = null

private class AppDbCallback: RoomDatabase.Callback() {
    override fun onCreate(db: SupportSQLiteDatabase) {
        super.onCreate(db)
        Log.d(TAG, "onCreate db called")

        if (appDb == null) {
            Log.e(TAG, "db not be created")
            return
        }

        CoroutineScope(Dispatchers.IO).launch {
            appDb!!.initDao().initializeDatabase()
        }
    }
}

fun connect(applicationContext: Context) =
    try {
        appDb ?: Room.databaseBuilder(
            applicationContext,
            AppDatabase::class.java,
            "app_db"
        )
            .addCallback(AppDbCallback())
            .setQueryCallback(
                { sqlQuery, _ -> Log.d(TAG, "SQL Query: $sqlQuery") },
                Executors.newSingleThreadExecutor()
            )
            .build()
            .also { appDb = it }
    } catch (e: SQLException) {
        Log.e(TAG, e.toString())
    }
```

```
    null
}
```

Описание сущностей:

```
@Entity(tableName = Table.Store.T_NAME)
data class StoreEntity(
    @PrimaryKey(autoGenerate = true)
    val id: Long = -1,
    @ColumnInfo(name = Table.Store.ADDRESS)
    val address: String
)

@Entity(tableName = Table.Product.T_NAME)
data class ProductEntity(
    @PrimaryKey(autoGenerate = true)
    val article: Long = -1,
    @ColumnInfo(name = Table.Product.NAME)
    val name: String,
    @ColumnInfo(name = Table.Product.CATEGORY)
    val category: String?,
    @ColumnInfo(name = Table.Product.QUANTITY_TO_ASSESS)
    val quantityToAssess: String
)

@Entity(tableName = Table.CheckList.T_NAME)
data class CheckListEntity(
    @PrimaryKey(autoGenerate = true)
    val id: Long = -1,
    @ColumnInfo(name = Table.CheckList.STORE_ID)
    val storeId: Long?,
    @ColumnInfo(name = Table.CheckList.TIME)
    val time: Long
)

@Entity(
    tableName = Table.Accounting.T_NAME,
    primaryKeys = [
        Table.Accounting.STORE_ID,
        Table.Accounting.PRODUCT_ARTICLE
    ]
)
data class AccountingEntity(
    @ColumnInfo(name = Table.Accounting.STORE_ID)
    val storeId: Long,
    @ColumnInfo(name = Table.Accounting.PRODUCT_ARTICLE)
    val productArticle: Long,
    @ColumnInfo(name = Table.Accounting.COST)
    val cost: Double?,
    @ColumnInfo(name = Table.Accounting.AMOUNT)
    val amount: Double
)

@Entity(tableName = Table.Purchase.T_NAME)
data class PurchaseEntity(
    @PrimaryKey(autoGenerate = true)
    val id: Long = -1,
    @ColumnInfo(name = Table.Purchase.CHECK_LIST_ID)
    val checkListId: Long? = null,
    @ColumnInfo(name = Table.Purchase.PRODUCT_ARTICLE)
    val productArticle: Long,
    @ColumnInfo(name = Table.Purchase.AMOUNT)
    val amount: Double
)
```

Dao объекты:

```

@Dao
interface InitDao {
    @Insert(onConflict = OnConflictStrategy.IGNORE)
    suspend fun insertStores(stores: List<StoreEntity>)

    @Insert(onConflict = OnConflictStrategy.IGNORE)
    suspend fun insertProducts(products: List<ProductEntity>)

    @Insert(onConflict = OnConflictStrategy.IGNORE)
    suspend fun insertAccounting(accounting: List<AccountingEntity>)

    @Transaction
    suspend fun initializeDatabase() {
        val stores = listOf(
            StoreEntity(id = 1, address = "LA, 5 Avenue"),
            StoreEntity(id = 2, address = "LA, 11 Avenue"),
            StoreEntity(id = 3, address = "LA, 12 Avenue")
        )

        val products = listOf(
            ProductEntity(
                article = 1,
                name = "Колбаса докторская",
                category = "meat",
                quantityToAssess = "100g"
            ),
            ProductEntity(
                article = 2,
                name = "Сырок плавленый",
                category = "milk",
                quantityToAssess = "p"
            ),
            ProductEntity(
                article = 3,
                name = "Молоко, бутылка 1л",
                category = "milk",
                quantityToAssess = "p"
            ),
            ProductEntity(
                article = 4,
                name = "Булочка \\"Лакомка\\"",
                category = "bake",
                quantityToAssess = "p"
            ),
            ProductEntity(
                article = 5,
                name = "Стейк, говяжий",
                category = "meat",
                quantityToAssess = "p"
            )
        )

        val accounting = listOf(
            AccountingEntity(storeId = 1, productArticle = 1, cost = 100.0, amount =
700.0),
            AccountingEntity(storeId = 1, productArticle = 2, cost = 30.0, amount =
300.0),
            AccountingEntity(storeId = 1, productArticle = 3, cost = 70.0, amount =
300.0),
            AccountingEntity(storeId = 1, productArticle = 4, cost = 35.0, amount =
200.0),
            AccountingEntity(storeId = 1, productArticle = 5, cost = 200.0, amount =
100.0),
            AccountingEntity(storeId = 2, productArticle = 1, cost = 190.0, amount =
700.0),
            AccountingEntity(storeId = 2, productArticle = 2, cost = 39.0, amount =
300.0),

```

```

        AccountingEntity(storeId = 2, productArticle = 3, cost = 79.0, amount =
300.0),
        AccountingEntity(storeId = 2, productArticle = 4, cost = 39.0, amount =
200.0),
        AccountingEntity(storeId = 2, productArticle = 5, cost = 290.0, amount =
100.0)
    )

    insertStores(stores)
    insertProducts(products)
    insertAccounting(accounting)
}

}

@Dao
abstract class ProductDao {
    @Query(
        """
        INSERT INTO ${Table.CheckList.T_NAME}
        (${Table.CheckList.STORE_ID}, ${Table.CheckList.TIME})
        VALUES (:storeId, CURRENT_TIMESTAMP);
        """
    )
    protected abstract suspend fun insertCheckList(storeId: Long): Long

    @Insert
    protected abstract suspend fun insertPurchase(purchase: PurchaseEntity): Long

    @Query(
        """
        UPDATE ${Table.Accounting.T_NAME}
        SET ${Table.Accounting.AMOUNT}=${Table.Accounting.AMOUNT}-:amount
        WHERE ${Table.Accounting.STORE_ID}=:storeId
        AND ${Table.Accounting.PRODUCT_ARTICLE}=:article;
        """
    )
    protected abstract suspend fun updateAccounting(
        storeId: Long,
        article: Long,
        amount: Double
    ): Int

    @Transaction
    open suspend fun executeBuy(
        storeId: Long,
        purchases: List<PurchaseEntity>
    ) {
        val checkListId = insertCheckList(storeId)
        purchases
            .map { it.copy(checkListId = checkListId) }
            .forEach {
                insertPurchase(it)
                updateAccounting(
                    storeId,
                    it.productArticle,
                    it.amount
                )
            }
    }
}

@Dao
interface StoreDao {
    @Query("SELECT * FROM ${Table.Store.T_NAME}")
    suspend fun getStores(): List<StoreEntity>
}

```

```

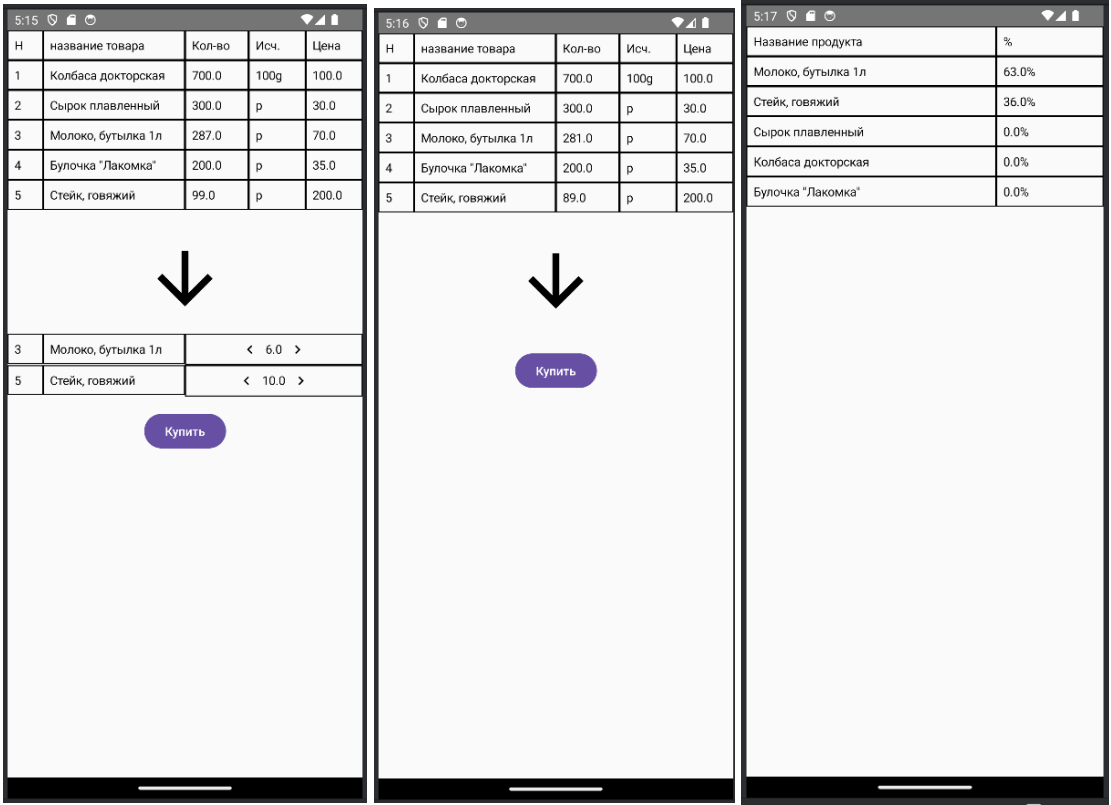
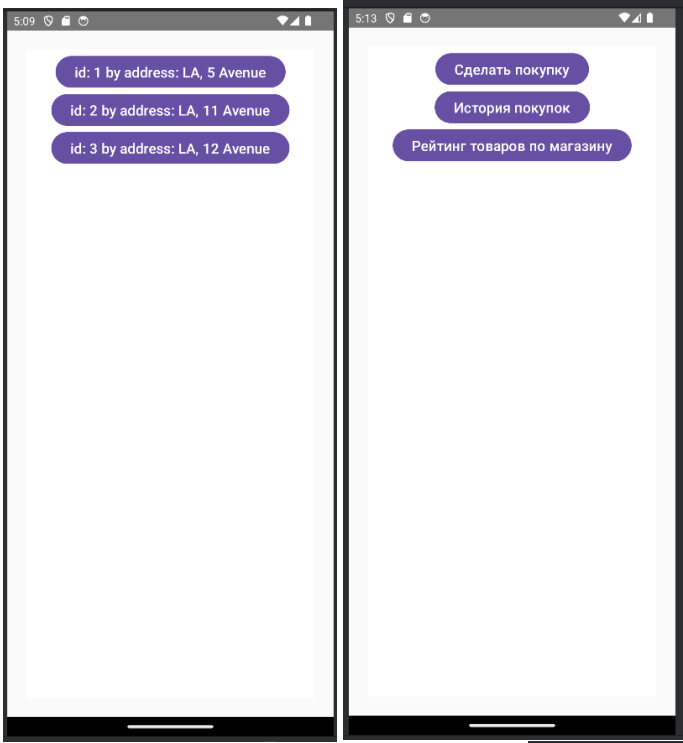
@Dao
abstract class BigQueryDao {
    @Query(
        """
        select  t0.${Table.CheckList.ID} as ${Models.History.ColName.CHECK_LIST_ID},
               t2.${Table.Product.NAME} as ${Models.History.ColName.PRODUCT_NAME},
               t1.${Table.Purchase.AMOUNT} as ${Models.History.ColName.AMOUNT},
               t2.${Table.Product.QUANTITY_TO_ASSESS} as
${Models.History.ColName.QUANTITY_TO_ASSESS},
               t1.${Table.Purchase.AMOUNT}*t3.${Table.Accounting.COST} as
${Models.History.ColName.COST}
        from  ${Table.CheckList.T_NAME} as t0
        inner join ${Table.Purchase.T_NAME} as t1
        on t0.${Table.CheckList.ID}=t1.${Table.Purchase.CHECK_LIST_ID}
           and t0.${Table.CheckList.STORE_ID}=:storeId
        inner join ${Table.Product.T_NAME} as t2
        on t1.${Table.Purchase.PRODUCT_ARTICLE}=t2.${Table.Product.ARTICLE}
        inner join ${Table.Accounting.T_NAME} as t3
        on t1.${Table.Purchase.PRODUCT_ARTICLE}=t3.${Table.Accounting.PRODUCT_ARTICLE}
           and t3.${Table.Accounting.STORE_ID}=:storeId
        order by t0.${Table.CheckList.ID} asc;
        """
    )
    abstract suspend fun getHistory(storeId: Long): List<Models.History>

    @Query(
        """
        select  t0.${Table.Accounting.PRODUCT_ARTICLE} as
${Models.Assortment.ColName.ARTICLE},
               t1.${Table.Product.NAME} as ${Models.Assortment.ColName.PRODUCT_NAME},
               t0.${Table.Accounting.AMOUNT} as ${Models.Assortment.ColName.AMOUNT},
               t1.${Table.Product.QUANTITY_TO_ASSESS} as
${Models.Assortment.ColName.QUANTITY_TO_ASSESS},
               t0.${Table.Accounting.COST} as ${Models.Assortment.ColName.COST}
        from  ${Table.Accounting.T_NAME} as t0
        inner join ${Table.Product.T_NAME} as t1
        on t0.${Table.Accounting.PRODUCT_ARTICLE}=t1.${Table.Product.ARTICLE}
        where ${Table.Accounting.STORE_ID}=:storeId;
        """
    )
    abstract suspend fun getAssortment(storeId: Long): List<Models.Assortment>

    @Query(
        """
        select  t2.${Table.Product.NAME} as ${Models.Rating.ColName.PRODUCT_NAME},
               round(coalesce(sum(t1.${Table.Purchase.AMOUNT})*100/(select sum(amount)
from  ${Table.Purchase.T_NAME})),0),2)
               as ${Models.Rating.ColName.AMOUNT_IN_PERCENT}
        from check_list as t0
        inner join ${Table.Purchase.T_NAME} as t1
        on t0.id=t1.${Table.Purchase.CHECK_LIST_ID}
           and t0.${Table.CheckList.STORE_ID}=:storeId
        right join ${Table.Product.T_NAME} as t2
        on t1.${Table.Purchase.PRODUCT_ARTICLE}=t2.${Table.Product.ARTICLE}
        group by t2.${Table.Product.NAME}
        order by ${Models.Rating.ColName.AMOUNT_IN_PERCENT} desc;
        """
    )
    abstract suspend fun getRating(storeId: Long): List<Models.Rating>
}

```

Скриншоты приложения:



Вывод: в ходе работы получены навыки разработки приложения, использующее технологию ORM, для взаимодействия с базой данных.