WOOSONG UNIVERSITY

Front-End Development for AI-based Household Garbage Collection System

Capstone Design in Company's Project

Team GUI

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Overview

- Development of O&M Functions(including GUI)
- Development of the Display Function of Driving Path and O&M Information on Map(Kakao Map)

Purpose

- Objective purpose is to enhance the efficiency of waste collection in South Korea by optimizing garbage truck routes
- Revolutionizing waste managment through technology
- Enhancing operational efficiency of garbage collector truck

Motivation and Necessity

Motivation

- Adressing challenges in traditional waste collection
- Contributing to environmental sustainability

Necessity

- Increasing urbanization and the need for smarter waste solutions
- Demand for smarter, technology driven solutions
- Meeting the demand for more effective waste managment systems

Technical Research

Technical Aspects

- Integration of GUI for garbage collector truck
- Incorporation of technologies for real-time data gathering

Research Objectives

- Enhance user interface for drivers
- Optimizing route planning and resource allocation

Differentiation

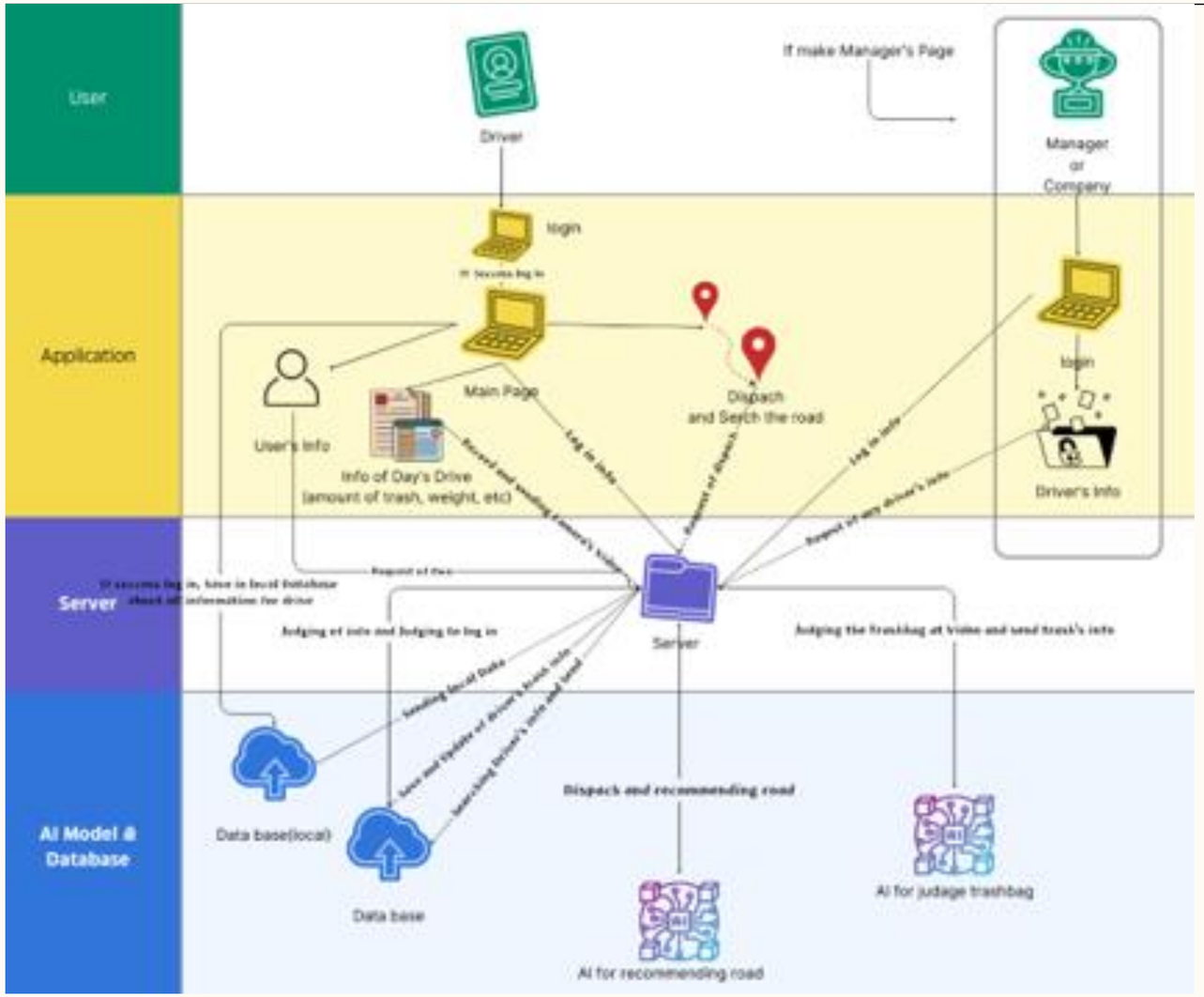
Comparison with Existing Technology

- User-friendly interface
- All in one:
- Counting collected garbage(type, size, weight, amount)
- Route setting and counting travel metrics

Development Environment

- GitHub – codebase version control
- Google Docs – shared documents
- KakaoTalk – communication channel
- VS Code – IDE for development
- Google Calendar – meetings schedule
- Canva – presentations creation

System Architecture



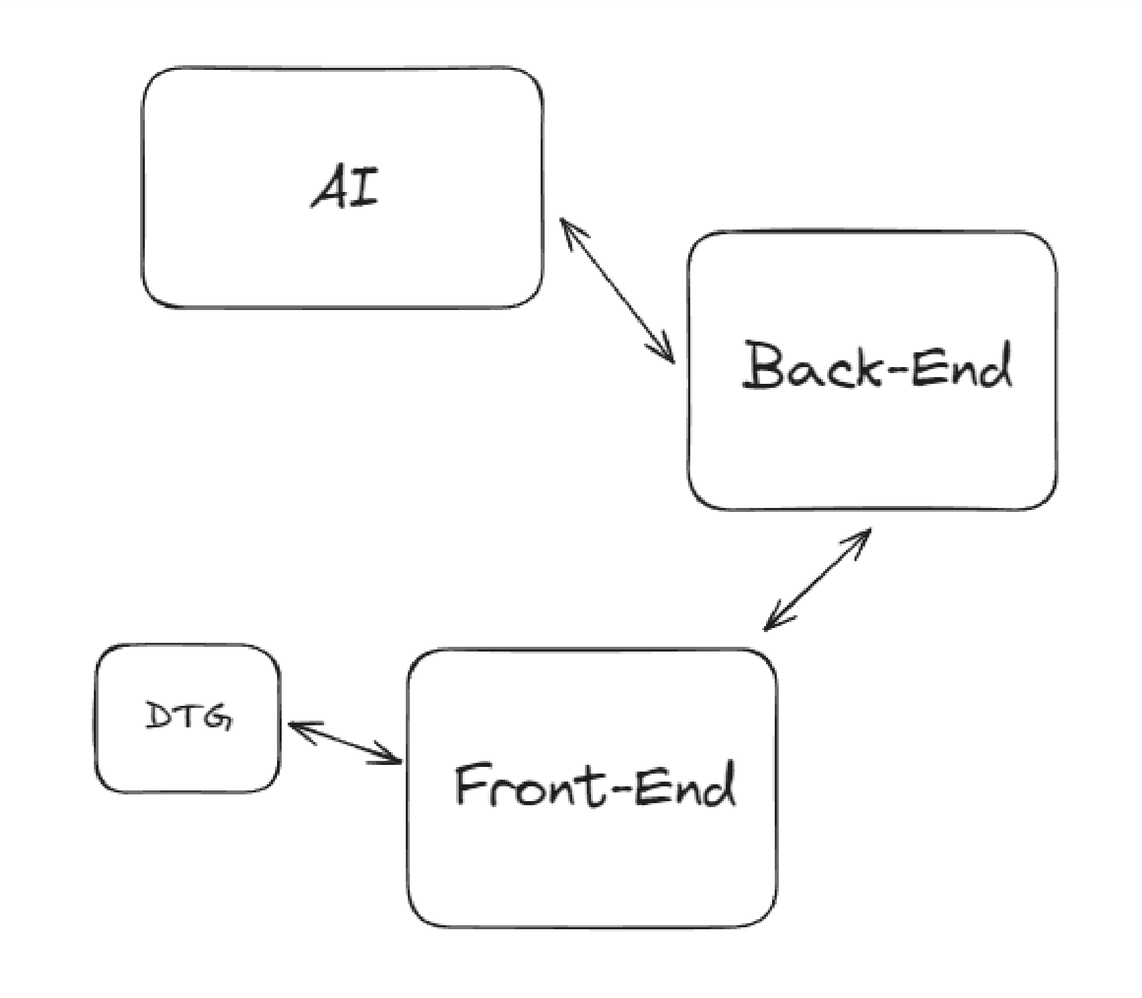
- The architecture of the entire application can be clearly divided into three main modules: frontend, backend and AI engineering

Development Contents and Scope

- Login page (form, buttons)
- Main page (trash bag counters, map, buttons)
- Records page (trunk state, collected garbage stats rendering)
- Trunk camera page (camera image transmission)
- Near-real-time fetching data from backend
- Driving data calculation
- KakaoMap integration with the API
- Responsive design
- Packaging and deployment with Electron

Project Contents

Theoretical & Technical Basis



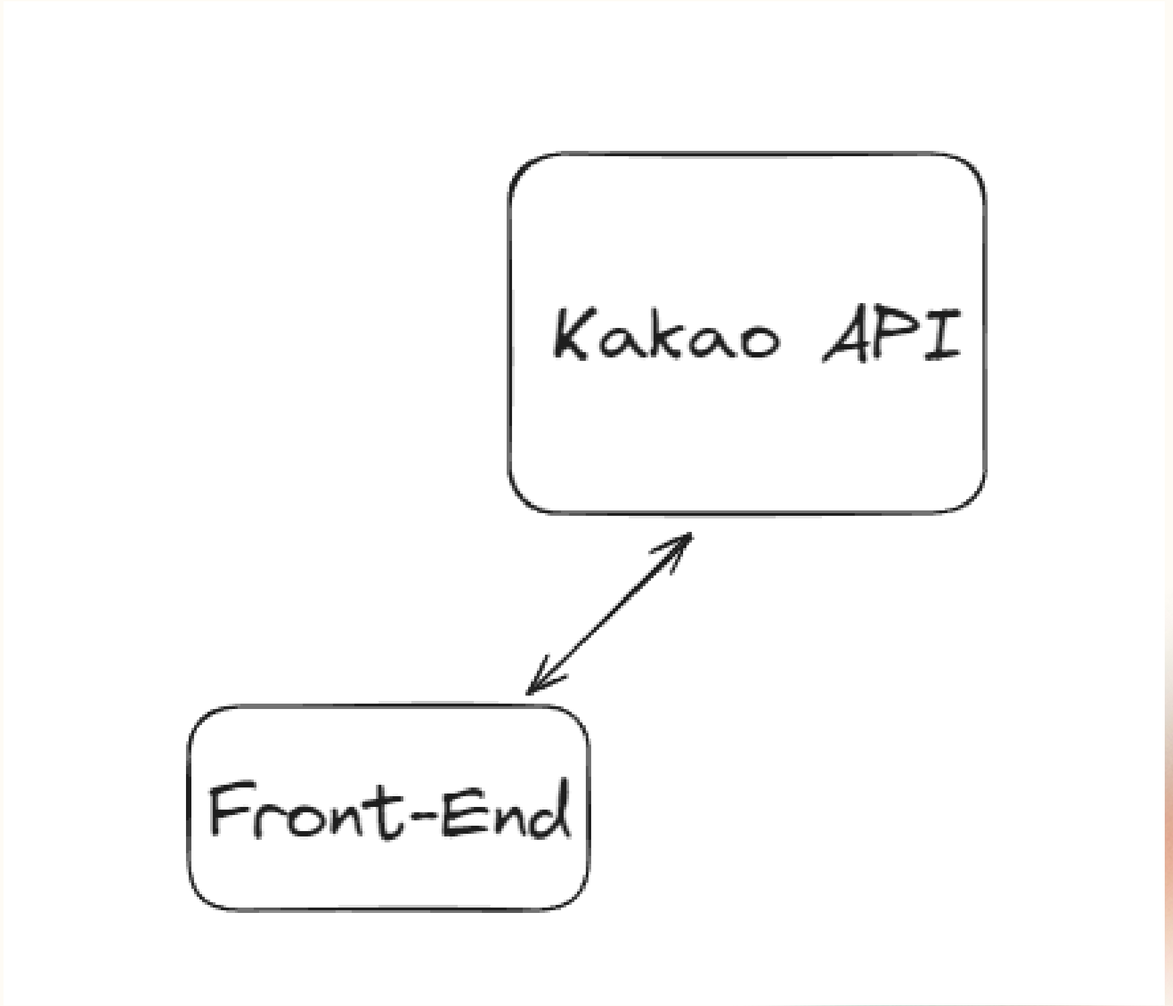
System Architecture

- AI sends data to the Back-End
- Front-End requests garbage related data from Back-End
- Front-End requests vehicle related data from DTG

- User Authentication
- Garbage Collection Information & Statistics
- Vehicle Runtime Information

Project Contents

Theoretical & Technical Basis



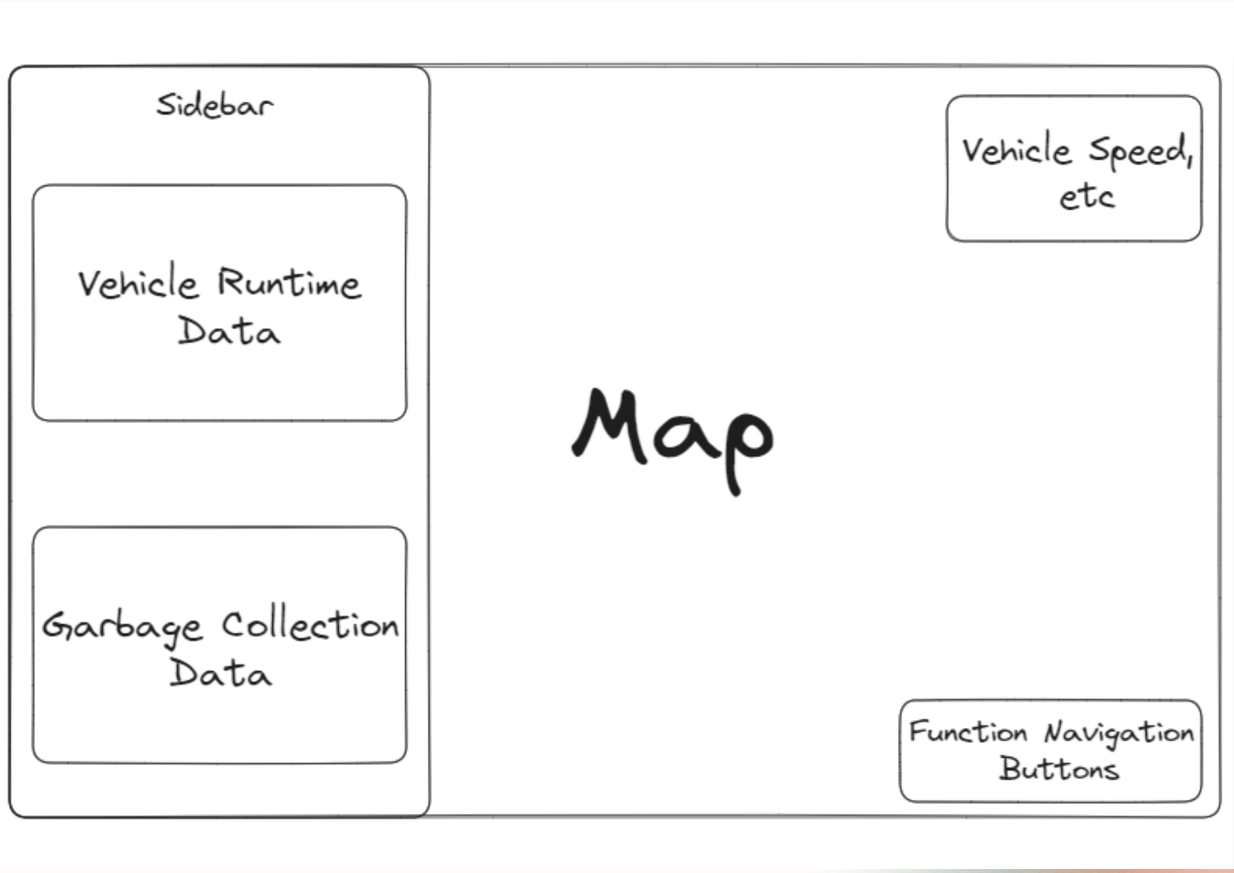
System Architecture

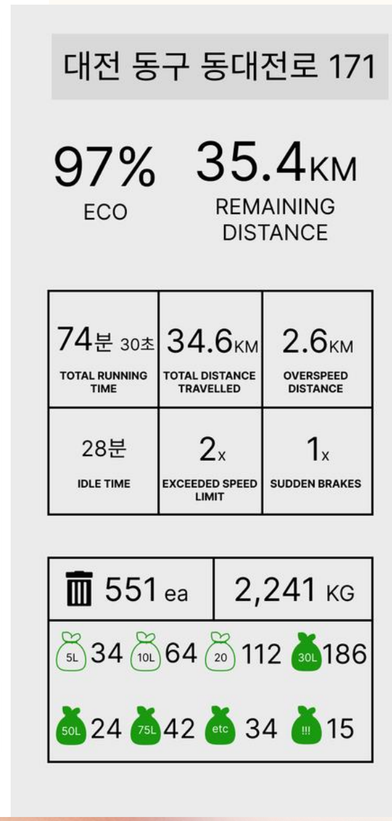
- Front – End requests mapping related data from Kakao

- Mapping Service
- Location Information & Pathing Service

Project Contents

Conceptual Design





Project Contents

Implemented Design

Project Contents

Features

Login Page
Authenticated via Back-End

Project Contents

Features

Main Page

- Connection to emulated DTG
- Garbage data from Back-End
- Map Service & Route Finder

Project Contents

Features

Records Page

Expected Effects

Environmental:

- Reduced carbon footprint: optimized routes can decrease fuel consumption and emissions, leading to a smaller environmental impact
- Improved waste management: accurate prediction of waste levels can optimize collection schedules, preventing overflowing bins and litter
- Enhanced recycling potential: data on waste composition can inform recycling initiatives and promote resource recovery

Expected Effects

Social:

- Improved public health: efficient waste collection reduces exposure to health hazards associated with overflowing bins and improper disposal
- Increased community satisfaction: residents benefit from cleaner streets, and improved overall sanitation
- Enhanced job satisfaction for waste management workers: optimized routes can decrease workload, reduce stress, and improve safety for drivers

Expected Effects

Economic:

- Cost savings for waste management companies: optimized routes can save on fuel, maintenance, and labor costs.

- Improved resource allocation: accurate data on waste generation can inform investments in infrastructure and waste management services.

Utilization

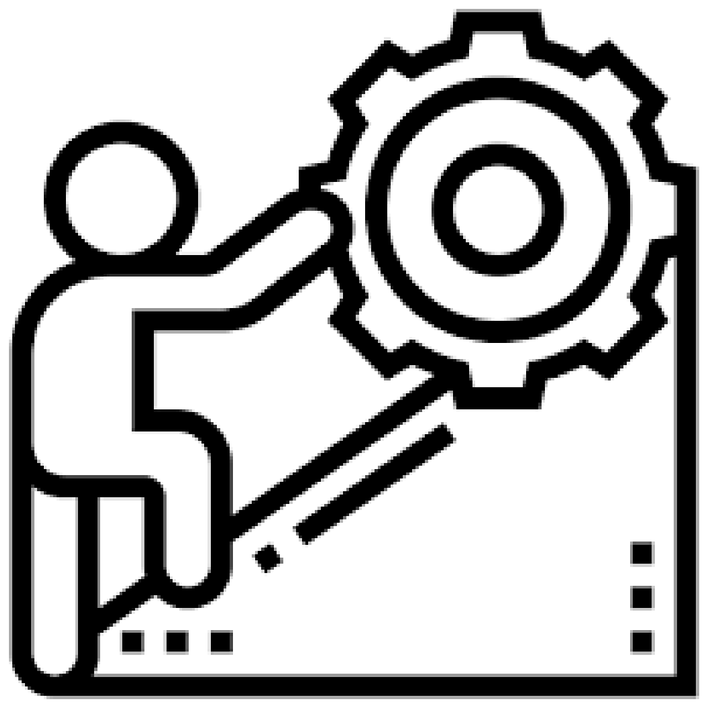
1. Pilot Program:
   - Implement the app on a limited scale to test its effectiveness and gather cilivilans' feedback
   - Collect data on fuel consumption, route efficiency, and user satisfaction

2. Expansion and Refinement:
   - Based on pilot program results, refine the app and address user feedback
   - Partner with technology companies and data analytics firms to offer a comprehensive solution

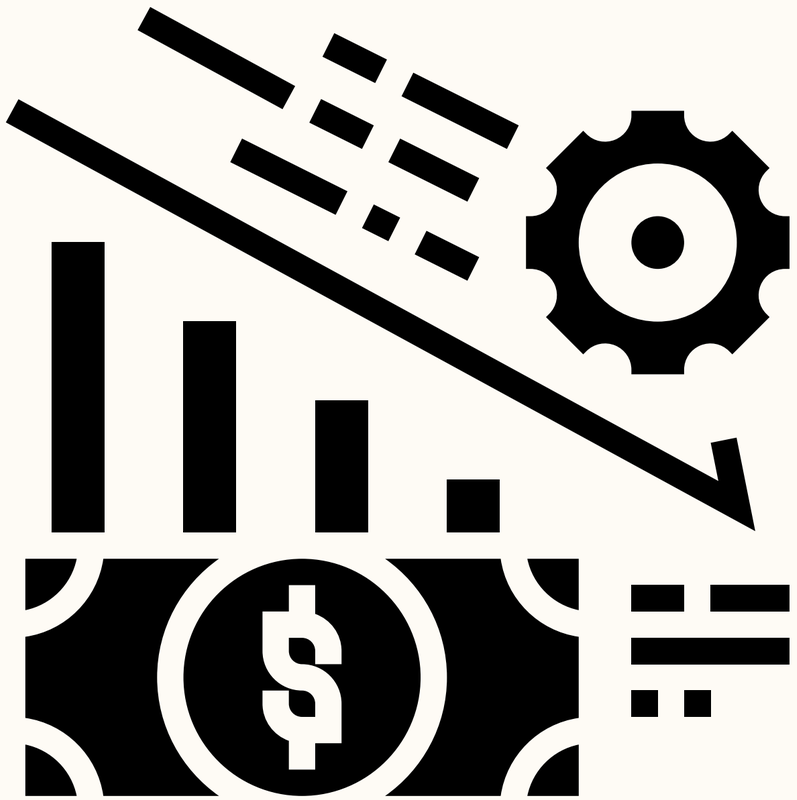
3. Scalability and Sustainability:
   - Develop a scalable architecture to accommodate growth and integration with various waste management systems
   - Develop a long-term strategy for continuous improvement and innovation

Challenges and Considerations

- Infrastructure integration: compatibility with existing waste management systems and hardware needs to be established
- User adoption: convincing waste management companies and drivers to adopt the new technology might require training and incentives
- Regulatory compliance: adapting the app to meet local regulations and waste management practices is crucial



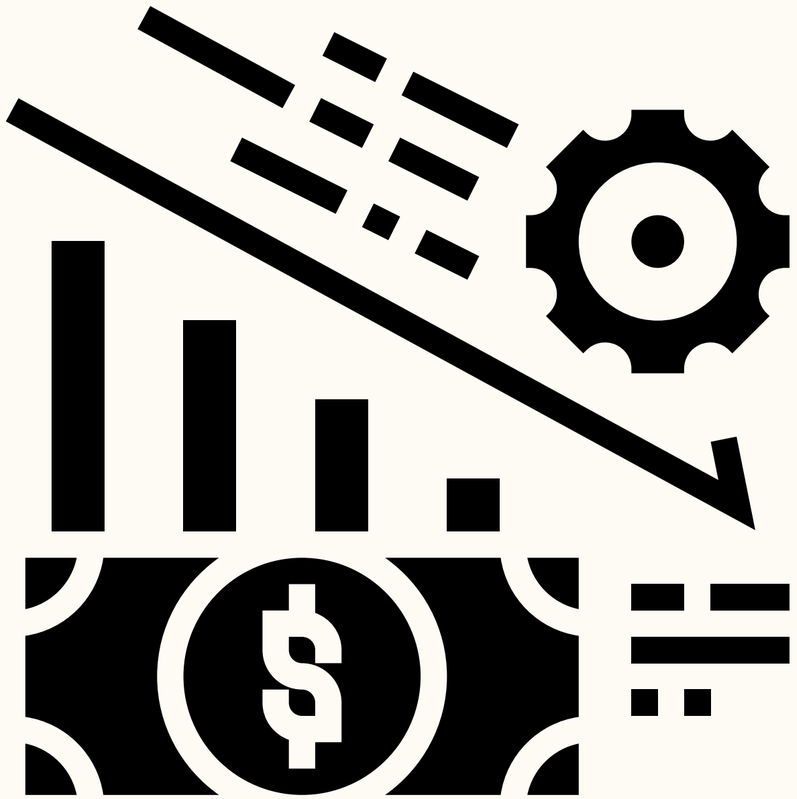
Cost Analysis & Role Distribution



Role Distribution:

- Aleskei (manage team and review code)
- Justin (integrate KakaoMap)
- Ali (apply css style)
- Akhmadjon (add dynamic with JS)
- 한승헌 (create HTML-markup)

Cost Analysis & Role Distribution



	Cost
ESG00-2 Display	96,360원
Kakao API	—
Google API	—

*Kakao and Google API was free during development,
costs are priced based on usage