



Generative Model Approach For Improving Streets Visual Distortion In Saudi Arabia



Reem Alluhaibi, Maryam Saif, Nada Altalhi, Yara Alharthi
Supervisor: Dr. Amirah Alharbi

Computer Science and artificial intelligence Department, Umm Al-Qura University, Makkah, KSA



Introduction

Background :

In a world where urban landscapes often bear the scars of visual distortion and unsightly graffiti, the fusion of creativity and cutting-edge technology offers a ray of hope. Generative Artificial Intelligence (AI) has emerged as a transformative force in the realm of art, providing a unique solution to counter the visual discord that plagues our cityscapes. With the power of generative AI, we embark on a journey to harness its capabilities for the creation of murals that not only beautify but also restore the visual harmony of our surroundings. This poster delves into the innovative applications of generative AI as we explore how it becomes a tool of choice to combat the blight of visual distortion and bad graffiti in our urban environments.

Problem Statement:

The presence of distorted writings and artworks on walls poses a significant challenge for cognitive cities, as they are traditionally dealt with manually. Moreover, the use of generative model techniques in this field is not effective in some regions due to its strong bias towards Western culture. Therefore, we propose steps to address this issue:

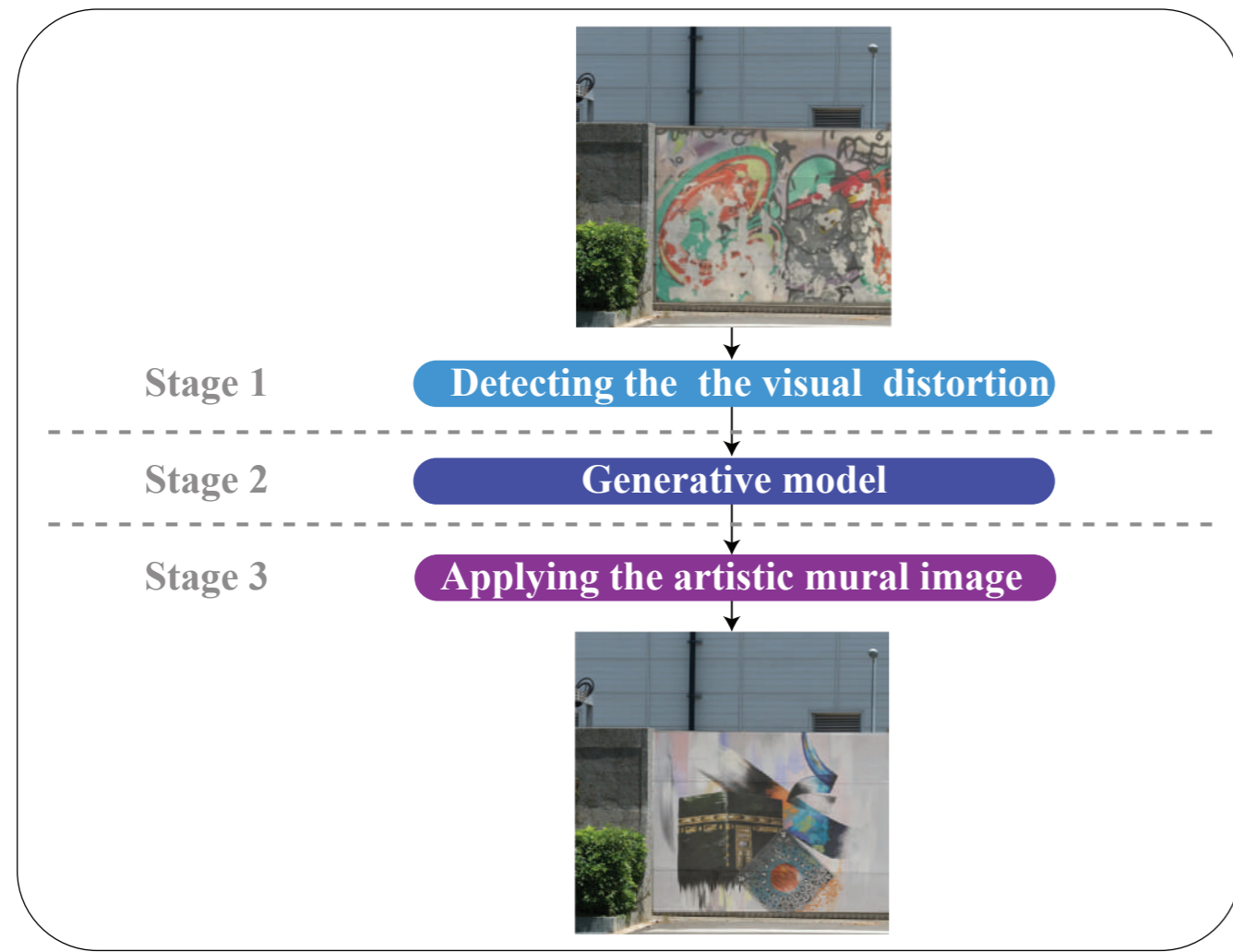


figure1: System Pipeline

Objective:

Our objectives are to fine-tune the model with artwork associated with the culture of Saudi Arabia and to handle the model using the Arabic language. This approach aims to address the bias in generative models towards Western culture.

Methodology

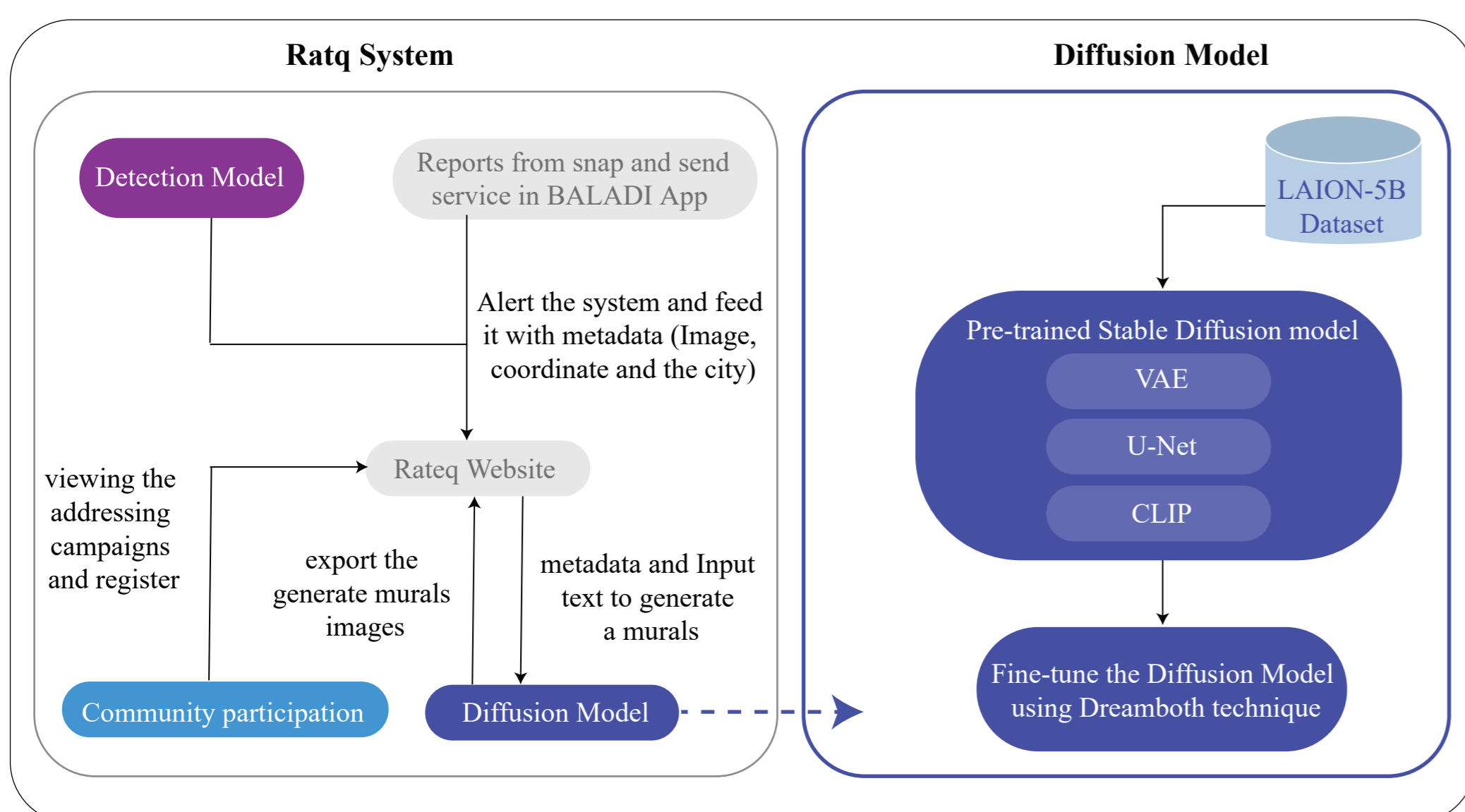


figure2: System Overview

Experiment

01 We have performed fine-tuning on a pre-trained Stable Diffusion model obtained from the HuggingFace website to achieve our goal of generating murals related to the culture of the Saudi Arabia. This process was carried out by experimenting with multiple fine-tuning techniques such as DreamBooth, Textual Inversion, and LoRa to determine the most suitable technique that aligns with our objectives.

02 We have added a function that accepts prompts in the Arabic language, enabling us to interact with the model using Arabic.

Result

The figures illustrate the model's outputs when requested to generate artwork related to Saudi Arabian culture, such as pilgrims and the Makkah clock. It shows the contrast between the Stable Diffusion model's outputs before (figure3) and after (figure4) fine-tuning.



figure3: Before the fine-tuning process



figure4: After the fine-tuning process

Conclusion

- 01 Novel utilization of generative models: Addressing visual distortion on city walls through the creation of artistic murals.
- 02 Model Modification: Customizing the model to accurately depict Saudi culture by training it on a dedicated dataset.
- 03 Dataset Collection: A dataset of over 500 images of Saudi cultural symbols has been collected and uploaded on Kaggle.
- 04 Language Adaptation: Adapting the model to accept Arabic language prompts.
- 05 Cognitive City Integration: Incorporating cognitive city concepts to empower city residents to create murals in line with their preferences and the city's culture.
- 06 Scientific Paper Submission: Preparing and submitting a scientific paper titled "Injection of Saudi Culture Subjects into Stable Diffusion Image Generative Model" for the Journal of Applied Computational Intelligence and Soft Computing, currently under review.

Future work

- 01 Enhancing Translation Accuracy: improving translation mechanisms or exploring alternative translation tools to ensure more accurate linguistic input for the AI model.
- 02 Quality of Synthetic Captions: Building on the strategy of re-captioning large-scale image datasets to improve the quality of captions could be a significant future effort.
- 03 Integration of Language Models: Leveraging large language models (LLMs), for transforming prompts and generating detailed captions can be further explored.
- 04 Subject Fidelity Metrics: Implementing metrics to assess subject fidelity and details in generated images