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Abstract

Enhancing the experience of Hajj and Umrah pilgrims is the third key objective of "Doyof Al Rahman Program", which is one of the realization programs of Vision 2030. Due to the importance of Hajj and Umrah seasons, many applications and research have been proposed towards enhancing the quality of the provided services and reducing the difficulties that pilgrims face, such as crowding, loss and the unavailability of health services. However, investigating the literature shows that many of these applications lack of comprehensive in terms of provided services that a pilgrim needs in one place.

Objectives

Develop MAAD utilizing software engineering and AI concepts.

Utilizing technology towards facilitating the experience of Muslims coming from all over the world to perform Hajj and Umrah.

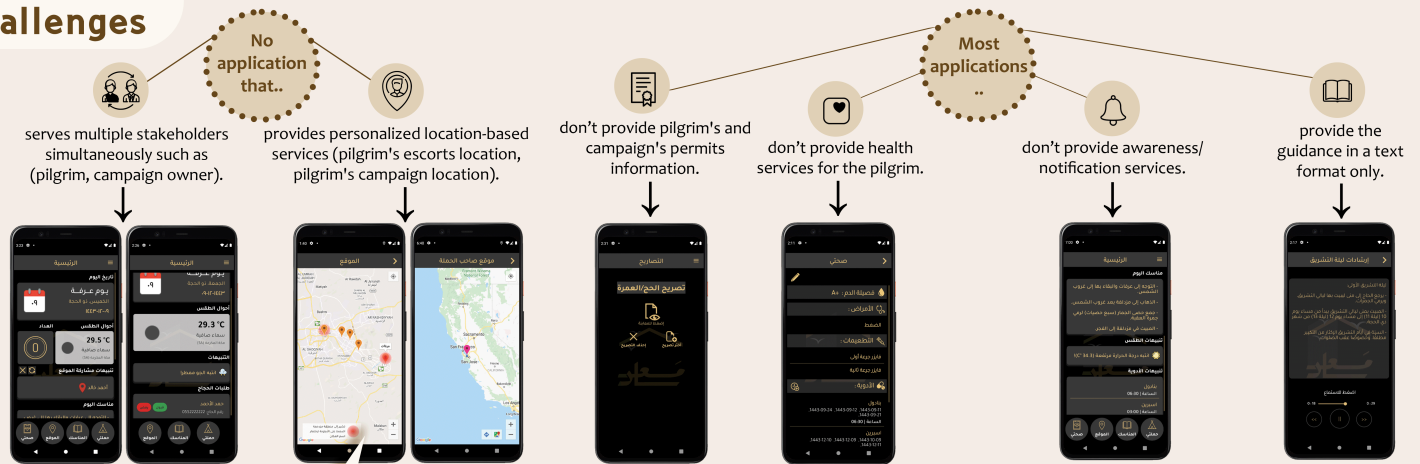
Related work

Existing applications table

System name	pilgrim	campaign owner	Application type			Output type		Location based services	Health and well-being	Hajj points	Hajj and Umrah Guide	Language			Assessment services		Feedback type	
			Information	Interactive	Personalized	General	Visual					Audio	Arabic	English	Other	crowd	weather	visual
Masafika	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Almanaf	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Abduh alshaki	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
3D Hajj	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Eatmanas	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
EatmanasBusiness	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Share Share Card	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Tafnoaj	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Al Maqad	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Hajj umrah ID	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Enhad	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Hajj and Umrah Guide (Arabic)	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Labbah	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Hajj quick Guide	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Hajj navigator	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Noobhan hamed	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Rafiq alhajj	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Hajj wa umrah (Arabic)	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
My personal guide (Arabic)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

* We also reviewed related publications.

Challenges



Crowd detection model

We developed the model which is:

- YOLO model (a pretrained object detection model).
- Customized to detect the heads of the people.
- It shows people heads count.
 - This count will help us to predict whether there is crowding or not.

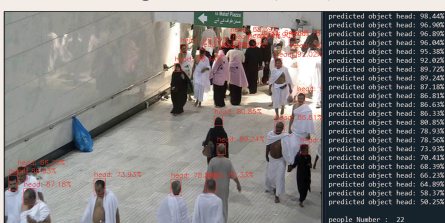
Dataset

- Obtained realistic videos of the holy places from the Custodian of the Two Holy Mosques Institute for Hajj and Umrah Resersh.
- We manually labeled the images extracted from these videos :
 - We extracted 200 high-quality images out of 500 images for training and testing.

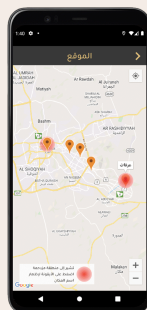


Result

The mean average precision (mAP) score is **67.2%**



$$\frac{\text{Detected people}}{\text{actual count}} = \frac{22}{26} \times 100 \approx 85\%$$



Location interface showing the crowded places

Used tools



Scholarly Achievements

1- " MAAD: A Mobile Advisory Application for Digitizing Hajj and Umrah Experience " *The Scientific Bulletin English Part- Scientific Forum for Hajj, Umrah and Madinah Visit Reserch* 21(2022): 113-122 (**published**).



2- "Is it Crowded? MAAD crowd detection model for Holy Places During Hajj and Umrah Seasons " *IEEE Access* (**submitted**).

Conclusion and Future work

Due to the depth and width of Hajj and Umrah experience, we planned to provide the following services in the future:

- Supporting other languages
- Improving guidance information
- Serving various stakeholders
- Offering a meal selection service

