

Geo-information for world heritage: 3D modelling of Yar City

Application of UAVs For Archaeological Research

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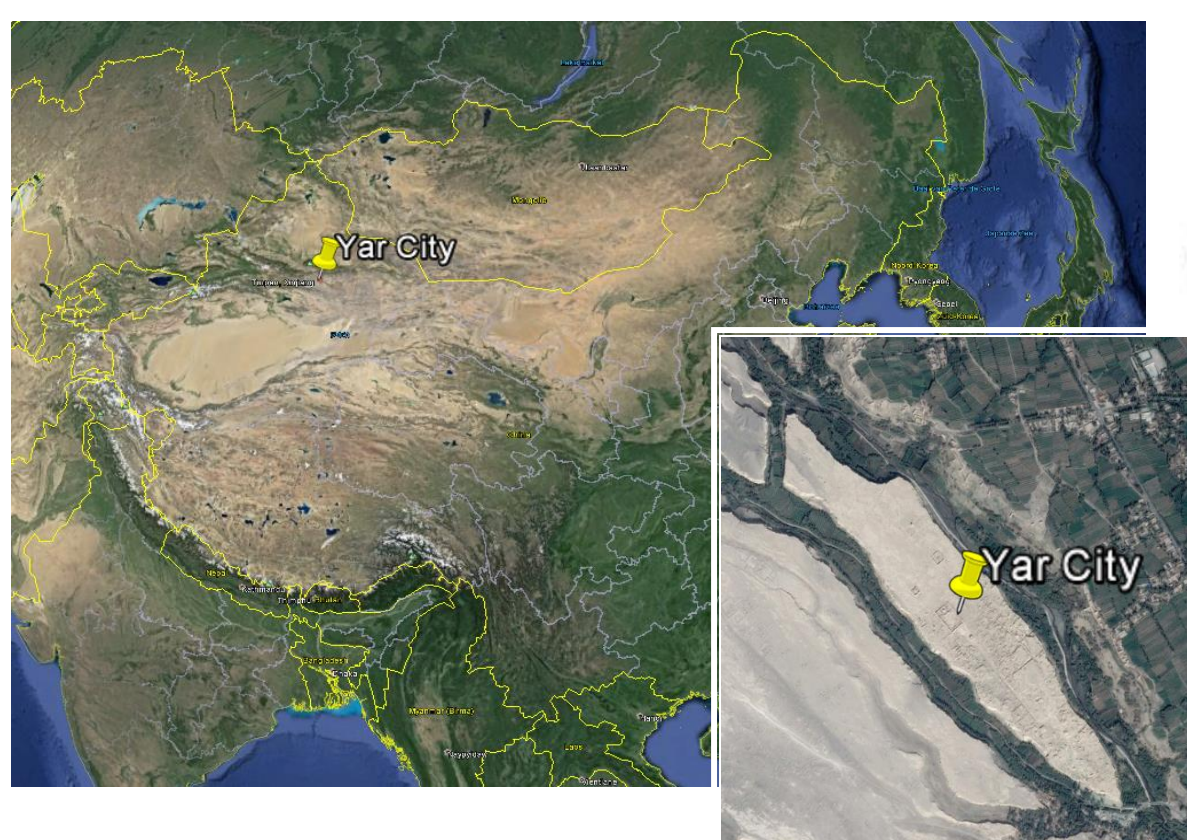
1. INTRODUCTION

Major archaeological sites, registered as World Heritage Sites, are exposed to the natural environment (sun, rain, and wind) and environmental pollution (air pollution, acid rain, ...). They risk disappearing in the near future due to the increasing threat of natural disasters (earthquakes, extreme rainfall or snowfall, violent sandstorms, landslides, floods, ...) and man-made disasters (urbanization, infrastructure construction, war, ...). Therefore, there is an urgent need to protect the heritage.

Detailed 3-dimensional modelling by digital photogrammetry and laser scanning is a technique that offers a new approach to, and opportunities for archaeological research.

The proposed research, with the first field campaigns in 2014-2015, frames a pilot project to develop a user-friendly and affordable 3D modelling using a modern low-cost digital camera and software. This method for world heritage research and preservation can then be applied in low-income regions around the world.

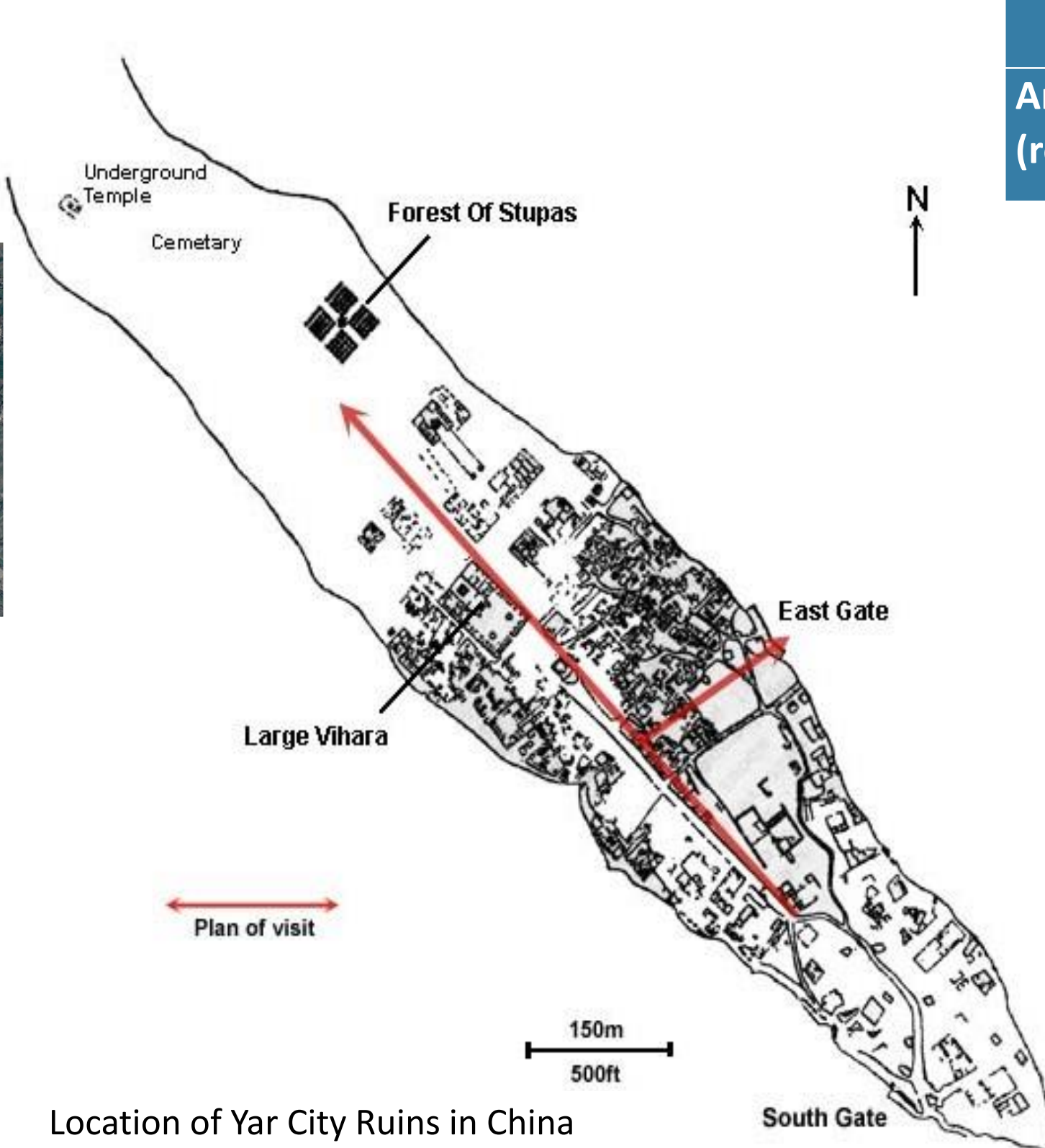
2. STUDY AREA



Yar City (Jiaohe - Xinjiang, China) was an important hub along the Silk Road. The site is more than 2100 years old and was abandoned after its destruction during the Mongol invasion led by Genghis Khan in the 13th century.

It is one of the largest and best preserved earthen cities in the world. However, Yar City is threatened by erosion due to the increased frequency of extreme weather events, such as sandstorms and downpours, caused by climate change.

In 2014, the ruins of Yar City became part of the Silk Road UNESCO World Heritage Site.



3. DATA ACQUISITION BY NON-SPECIALISED EQUIPMENT

Digital Camera

- Canon EOS 450D
- Sony Nex 5R

Platform

- UAV
- Fishing pole
- Hand

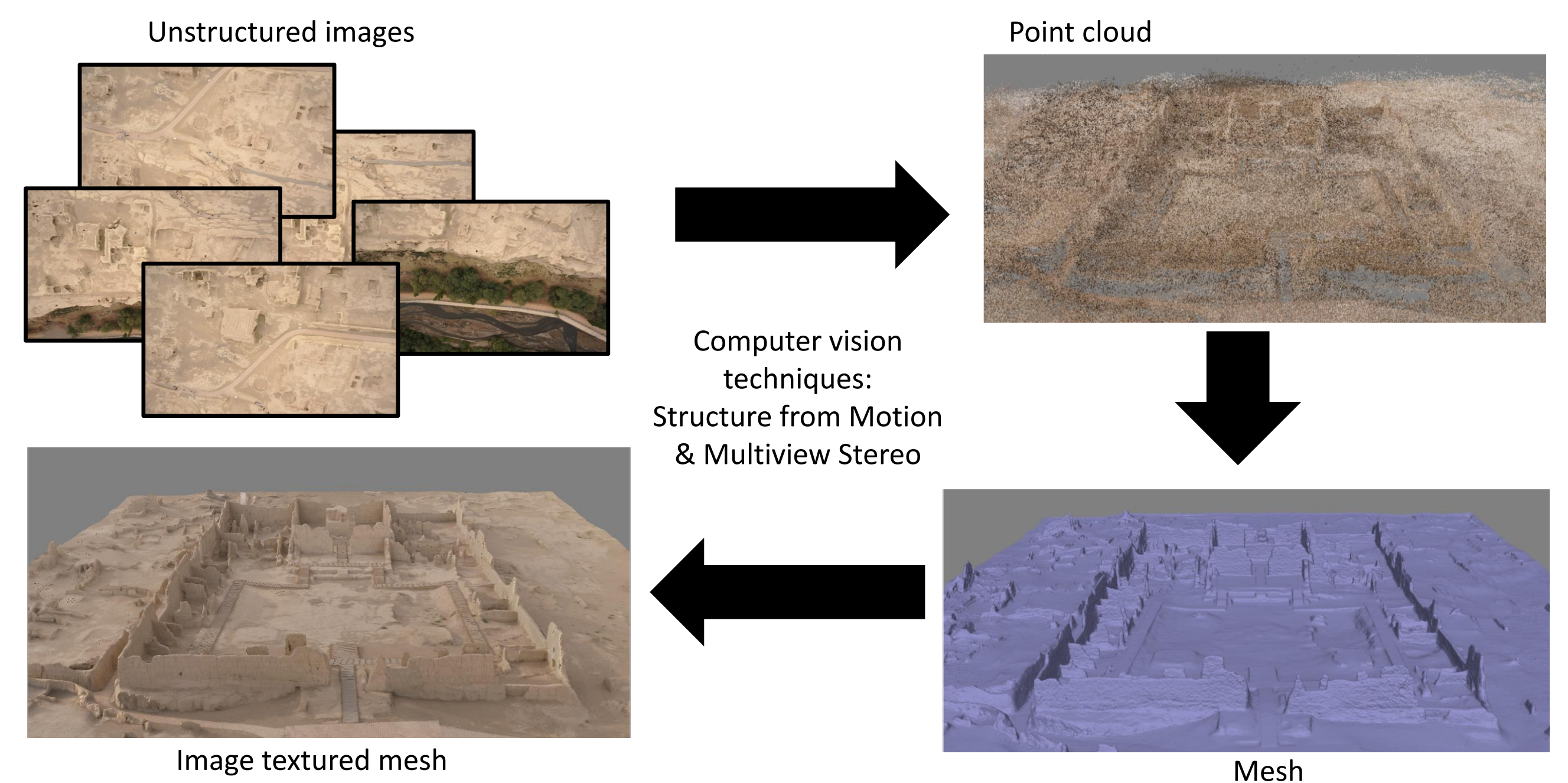
Surveying instruments

- EDM
- Total Station
- GNSS - RTK



	UAV	FISHING POLE	HAND
Ease of use	Simple	Unwieldy	Simple
Cost materials	High	Low	Low
Treading the terrain	Not necessary	Necessary	Necessary
Additional equipment	Complex	Simple	Simple
Required technical knowledge	Extensive	Limited	Limited
Data structuring	Structured by flight (programmed)	Structured by path (variable)	Structured by object (variable)
Amount of collected data (resolution vs. area)	Big area, lower resolution	Small area, higher resolution	Small area, higher resolution

4. 3D MODELLING



5. 3D MODEL OF YAR CITY BY PHOTO MODELLING

Forest of the Stupas



Bird View of Yar City



East Gate



Grand Temple (Large Vihara)



Access models



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