

# The Road to Manzikert



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- builds on work initiated by Vince Gaffney and John Haldon in the Birmingham/Princeton Medieval Logistics Group
- uses Agent-Based Modelling to investigate the context of the Byzantine army's journey to the Battle of Manzikert in AD1071



- The Battle of Manzikert
- Agent-Based Modelling (ABM)
- What can ABM do for our knowledge of the Manzikert campaign?



Image removed for copyright reasons



# The Manzikert Campaign



# The Manzikert Campaign

Manzikert



Seljuk Turks



# What is a model?

A simplified, abstracted view of a more complex reality

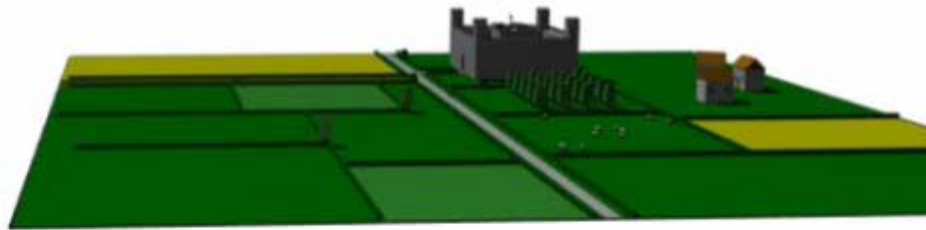




# Agents



# Environment

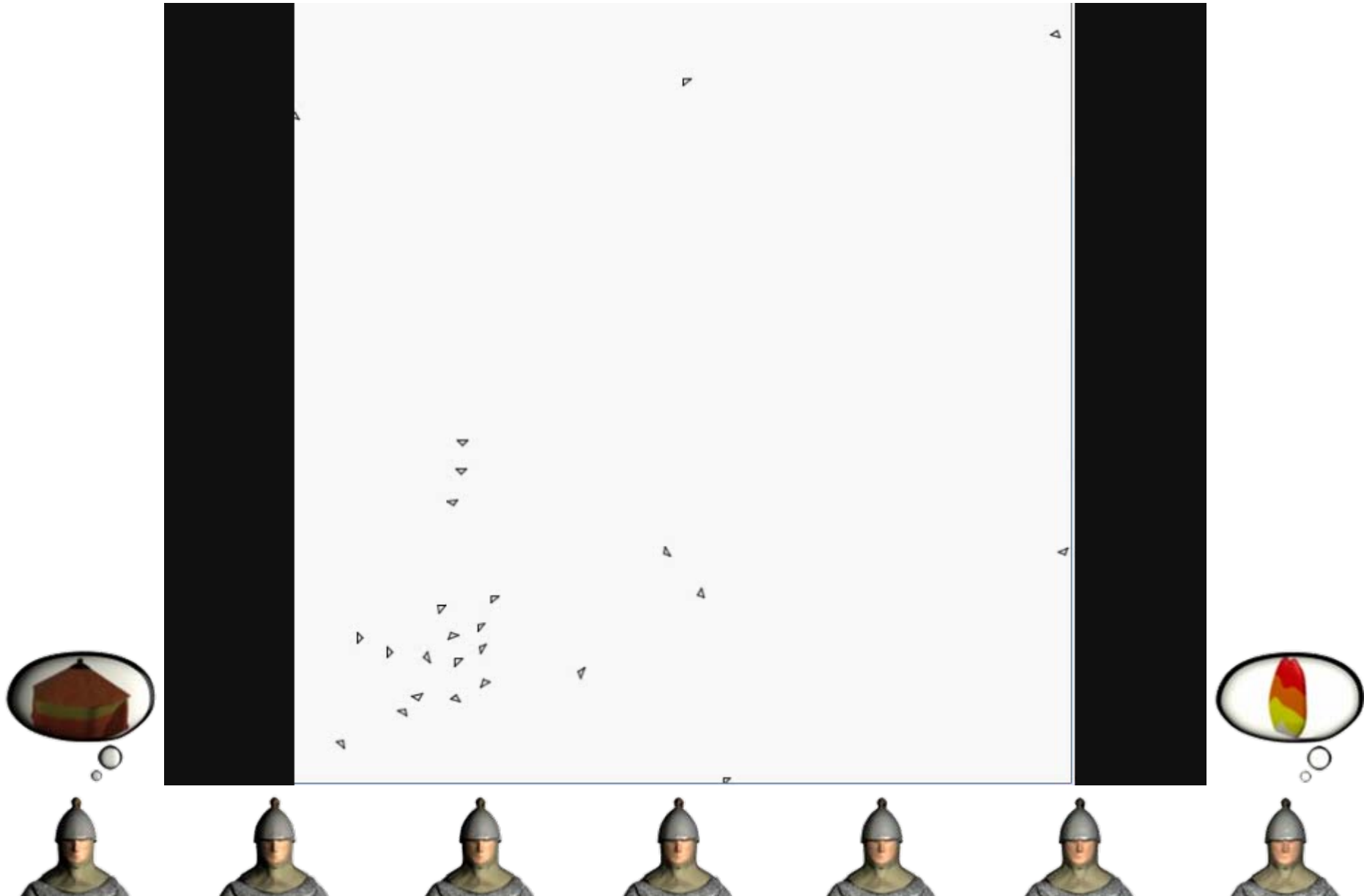


MHGS AviTools

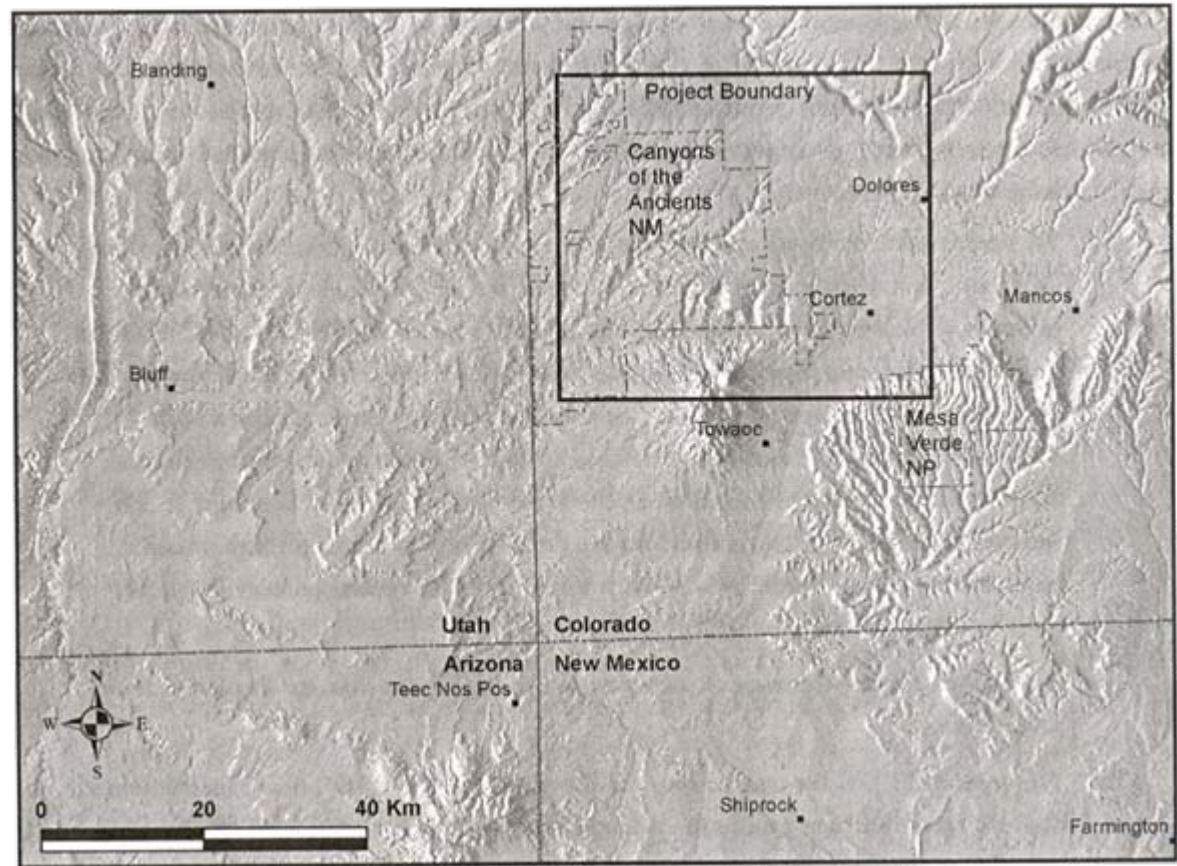




# Agent-based Modelling in archaeology



## The Village Project - Washington State University





# Agent-based Modelling in archaeology



<http://www.flickr.com/photos/sandys-pictures/>



# What is the purpose of Agent-based Modelling?

- Not recreating the past
- Null hypothesis



# What can Agent-based Modelling tell us about the Manzikert campaign?



# The Road to Manzikert

-  = 1,000 men
-  = minimum
-  = maximum

Matthew of Edessa



Ibn Al Qalanisi



Imad Ad Din and Al Fariqi



Ibn Al Athir



J.J. Norwich



J.J. Norwich 60-70,000

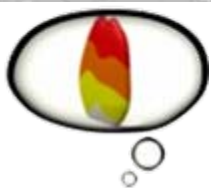
J.F. Haldon



J.F. Haldon 40-60,000



# The Road to Manzikert



# What are the requirements of Agent-based Modelling?

- A well-defined group of agents with plausible behavioural rules
- A detailed environment to interact with
- Software that can govern the interactions of the agents and the environment on the hardware available
- Adequate hardware



## Agents

- Army organisation and composition
- Human and animal physical endurance
- Human and animal health
- Equipment
- Sensory data



## Environment

- Terrain
- Climate
- Water sources
- Settlement types and distribution
- Transport methods and infrastructure
- Food (human and animal) and industrial production

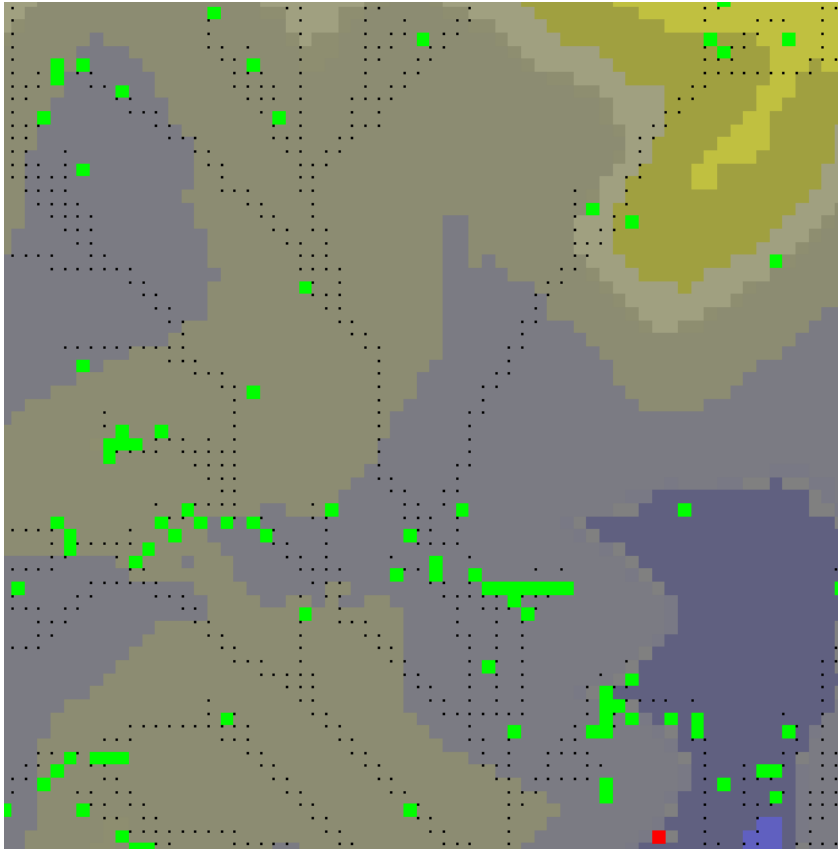


## Hardware

- University of Birmingham's BlueBear cluster
- 384 dual-processor dual-core (4 cores/node) 64-bit worker nodes giving a total of 1536 cores
- over 150 TB disk space



# The Road to Manzikert



- Statistics
- 2D plans
- 3D animations



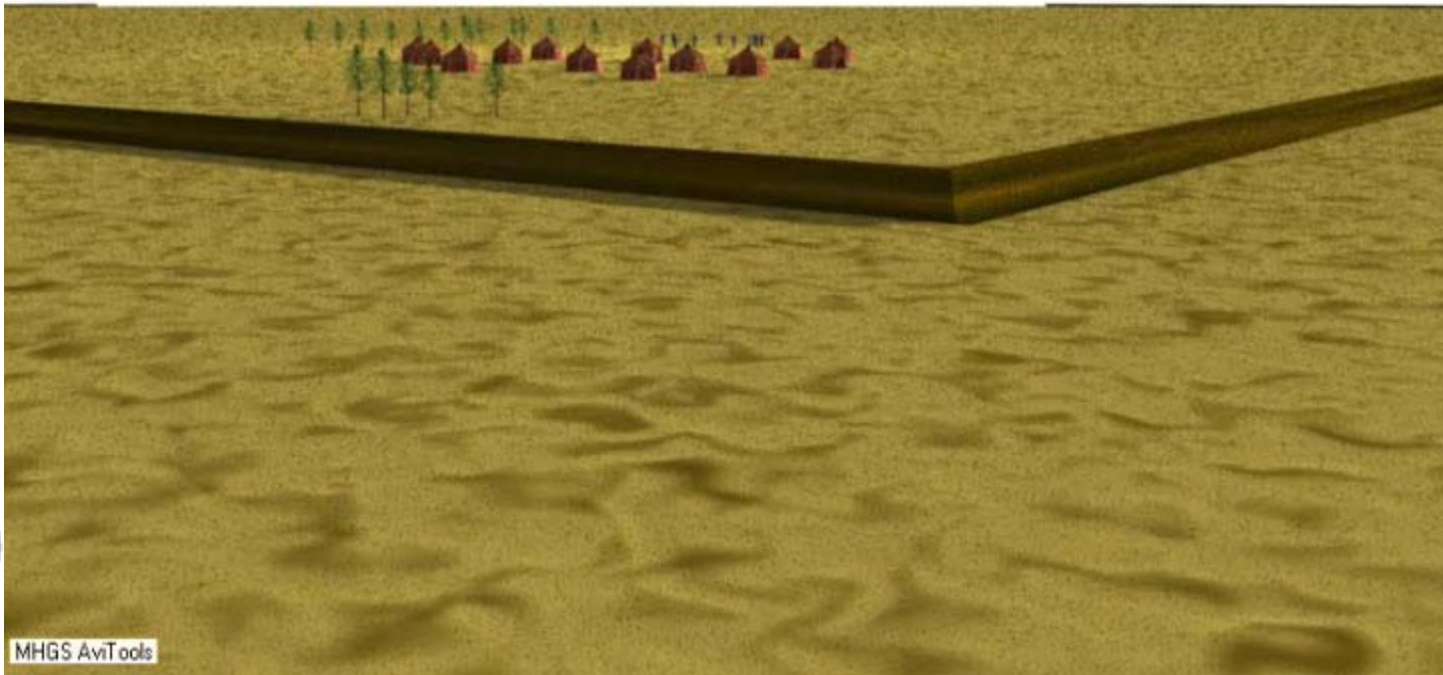
# The Road to Manzikert



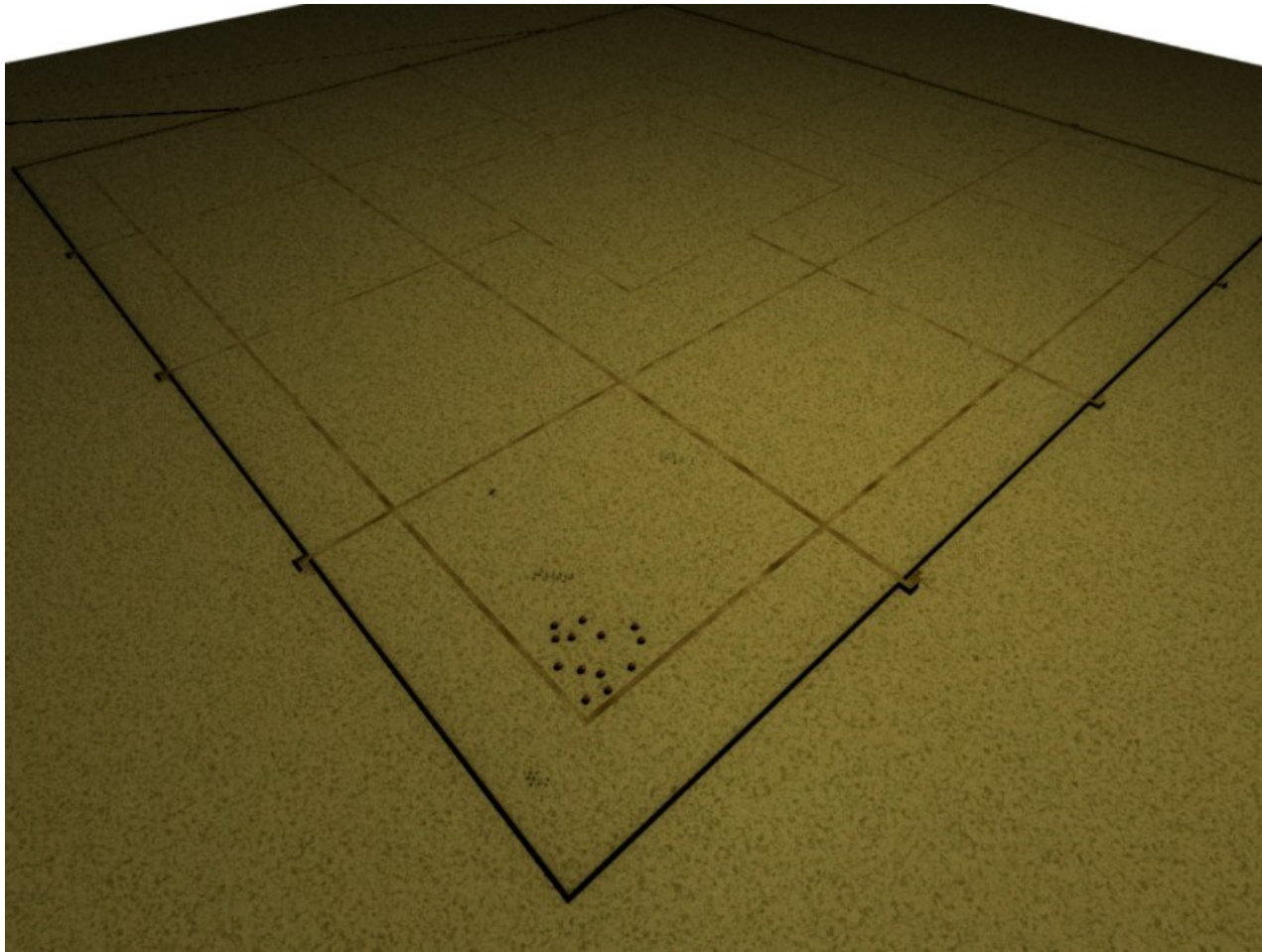
MHGS AviTools



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# The Road to Manzikert

