Using mobile robotic platforms to improve decision-making in geoscience field research

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Interdisciplinary Collaboration: Geology, Robotics, & Cognitive Psychology
Qian et al. (2017) Aeolian Processes
How is geologic decision making influenced by the availability of real-time, in-situ measurement data?
Simulated Geologic Decision-Making Scenario

Participants, $N = 41$

- Geoscientists
- Recruited at AGU & through research team contacts
- 73% male, $n = 30$
- Roughly equal numbers of graduate students, postdocs, & professors
\[ k_1 > 0 \]
\[ k_2 = 0 \]

Soil Strength

Moisture

Diagram showing soil strength and moisture relationship with labeled sections:
- Crest
- Stoss slope
- Slip face
- Interdune

Wind direction indicated by arrows.
Step 1. Select an Initial Sampling Strategy

Total Number of Locations \([up to 22]\)

Order to Visit Locations \([no restrictions]\)

Number of Samples at Each Location \([up to 10]\)
Step 1. Select an Initial Sampling Strategy

85% of participants chose locations at roughly homogenous intervals.

ALL participants took a consistent number of samples at each location, i.e., the MAGIC number.
Step 2. Sampling Strategy is Executed and Data is Provided in Real-Time
Step 3. Changes in Sampling Strategy in Response to Incoming Data

- No change [27%]
- Change, same number [49%]
- Change, different number [24%]
Conclusions

The Bad

Anchoring bias

Initial sampling strategy
Magic number
Step 4. Make a Conclusion
Conclusions

**The Bad**

Anchoring bias

*Initial sampling strategy*

*Magic number*

**The Good**

Intuitive understanding of statistical fit

*Simple step function*
Thank You

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