Unrestricted 2D Polygon Puzzle Solving with Applications to Archaeology

The interdisciplinary Computational Vision Laboratory

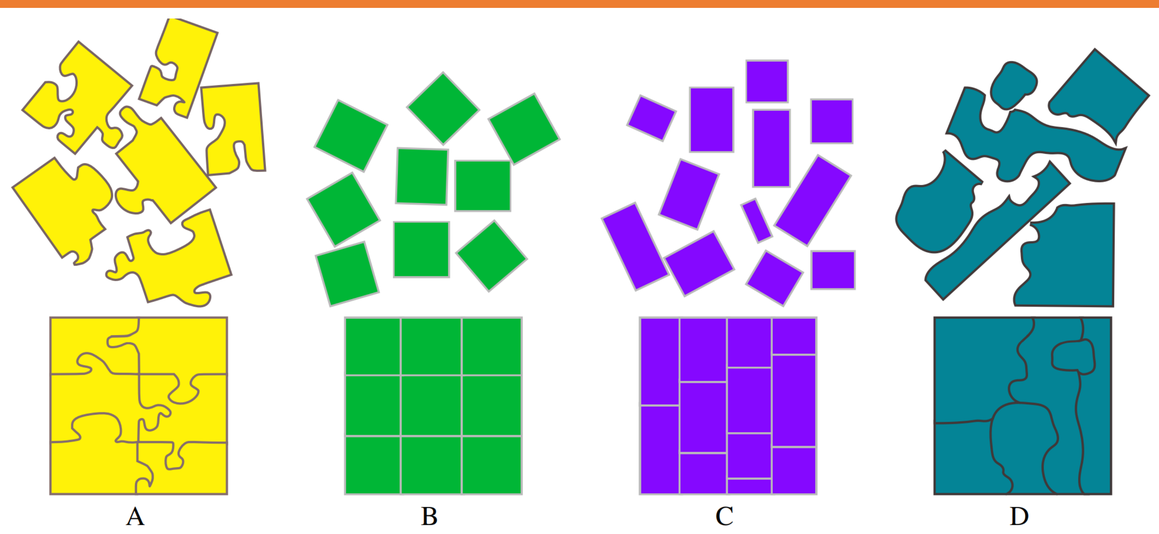
Yaniv Ohayon Ohad Ben-Shahar

Department of Computer Science, Ben Gurion University

EUROPEAN COMMISSION

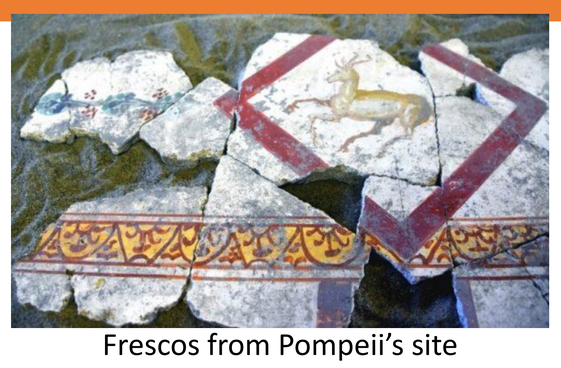
1.Background

- In order to “solve a puzzle”, one needs to arrange a bag of unordered and non-overlapping fragments in specific location and orientation.
- During the matching process, shape geometry and optionally visual content (pictorial) are considered.
- The right figure shows examples of puzzle types. The top row shows the bag of pieces, and the bottom row shows the solved puzzle. **A**: Commercial puzzle. **B**: A square jigsaw puzzle. **C**: brick wall puzzle. **D**: unrestricted puzzle - this work will focus on it.
- Most of the previous work concentrate on square jigsaw puzzles , leaving the geometric factor behind. This factor consideration is a key point for this research novelty



2. Motivation

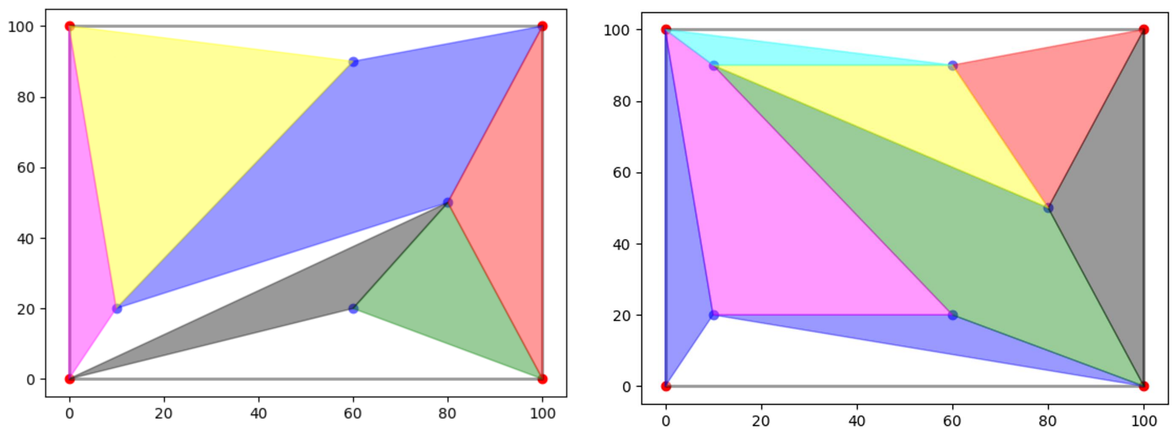
- The general problem has countless real-world applications, including in archaeology, biology or the restoration of shredded documents
- The international RePAIR project objective is to reconstruct archeology from the ruins of ancient Pompeii
- Our lab (iCVL), is responsible for assembling frescos fragments.
- This research will make a significant progress towards RePAIR’s problem.



Frescos from Pompeii’s site

3. Research Questions

- This research aims to solve unrestricted puzzle with pictorial data and convex shapes.
- The pieces will be noised, some will be missing, and the bags of pieces will contain fragments from more than one puzzle
- Challenge yourself:
  - Given a sampled set of points on a 2D plane, how many puzzle you be able to create where the pieces are convex polygons?
  - While creating a single puzzle by connecting the dots, How can you guarantee convexity and polygon closure?

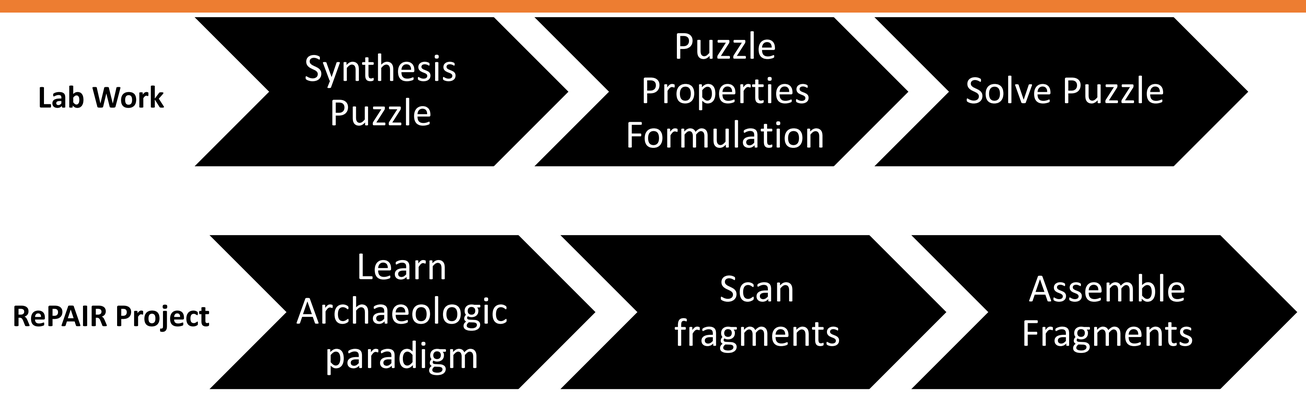


Examples of synthesis puzzles so far

4. Work Outline

Aspect	Lab	RePAIR Project
Data	Artificial	Real World
Perspective	Theoretic	Practical

Aspects of work



Work Phases