



# Introduction to Digital Level Layers

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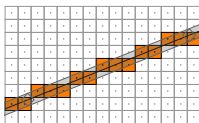


**ISIT**

- Linear digital primitives: a peaceful world

Morphological approach

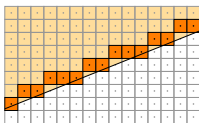
$$(S + \blacklozenge) \cap \mathbb{Z}^d$$



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Topological approach

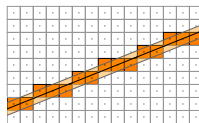
$$\partial(S^- \cap \mathbb{Z}^d)$$



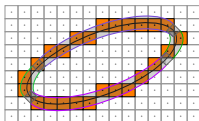
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Algebraic approach

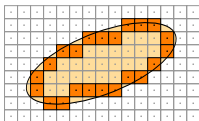
$$\{\mathbf{x} \in \mathbb{Z}^d \mid h < f(\mathbf{x}) < h'\}$$



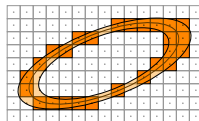
- Non linear digital primitives: you have to choose



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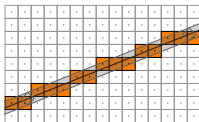


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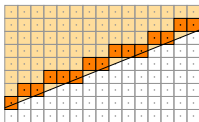
## Linear digital primitives: a peaceful world

Morphological approach  
 $(S + \diamond) \cap \mathbb{Z}^d$



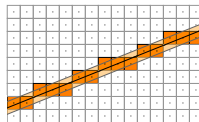
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Topological approach  
 $\partial(S^- \cap \mathbb{Z}^d)$

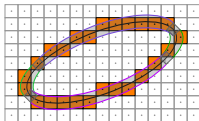


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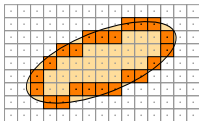
Algebraic approach  
 $\{\mathbf{x} \in \mathbb{Z}^d \mid h < f(\mathbf{x}) < h'\}$



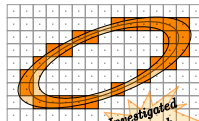
## Non linear digital primitives: you have to choose



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Investigated approach

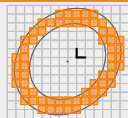


## Digital Level Layers (DLL)

Subset of points  $\mathbf{x} \in \mathbb{Z}^d$  such that

$$h \leq f(\mathbf{x}) \leq h'$$

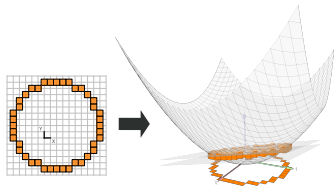
with  $f : \mathbb{Z}^d \rightarrow \mathbb{R}$  and  $h, h' \in \mathbb{R}$



### Problem

**Input:** Set of points  $S \in \mathbb{Z}^d$

**Output:** Characteristics of a DLL that “tightly” enclose  $S$



- Solutions:
- Linear Programming (Meggido)
  - Computational Geometry (Chord's Algo, GJK'nD)