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Understanding Images

What's new in eCognition Developer 8?

Object Generalization - Pixel-based resizing

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Table of Contents

Introduction to this Module

This Module gives you an introduction to a new algorithm in eCogntiton Developer 8, the '**pixel-based resizing**'. An artificial image is used to explain the capabilities of this algorithm.

Goal of this Module is to give you an introduction to this new algorithm, the different modes available and possible application fields.

This Module has two Lessons: Lesson 1 Introduction to algorithm 'pixel-based object resizing' and Lesson 2 Generalize Object outlines – fill intrusions, cut .

Symbols at the side of the document

The symbols at the side of the document shall guide you through the exercises and help you to identify whether to read something or an action is needed or whether the screenshot is meant to be compared with settings in the software.

Introduction

Information

If the side is hachured and 'Introduction' is added, this indicates that a text is giving a general introduction or methodology about the following chapter, method or exercise.

If the side is hachured and 'Information' is added, this indicates that a text is giving information about the following exercise.

Action!

If this symbol is shown, you have to follow the numbered items in the text. If you just want to work through the exercises without reading the theory part, follow only this sign.

Settings Check

If this symbol is shown, compare the settings shown in the screenshot with the settings in the according dialog box in the software.

Rule Set Check

If this symbol is shown check the screenshot of the Process Tree with the content of the Process Tree in the software.

Result Check

If this symbol is shown check the screenshot aside with the result in the software. It should look similar.

Lesson 1 Introduction to algorithm 'pixel-based object resizing'

This Lesson covers the following content

- *Resizing modes*
- *Conditions for resizing*
- *Applications*

1.1 Resizing modes

Introduction

For this algorithm you can choose between 3 different resizing modes: Growing, Shrinking and coating.

- **Growing** means one row of pixel is added an merged with the original object per execution.
- **Shrinking** means one row of pixels is taken away from the original object and classified in a separate class.
- **Coating** means one row of pixels is cut around the original object and classified to a separate class.

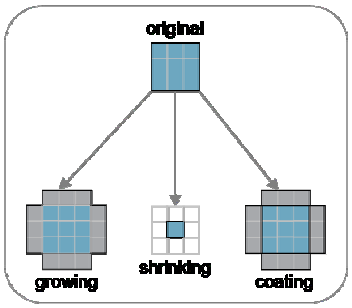


Figure 1: Graph showing the effects of the different resizing modes.

1.2 Conditions for resizing

Introduction

With the algorithm 'pixel-based resizing' conditions can be set for pixels to be added or cut.

Pixel constraints per layer

You can set pixel layer constraints, e.g. the pixel to be grown into must have low values for panchromatic layer.

Surface tension

You can define surface tension per **object** or per **class**. A defined **box** is then drawn for every pixel and the entered operation and value represent to **coverage** of the object/class.

If the surface tension condition is fulfilled the object will then grow or shrink, if not, nothing is executed.

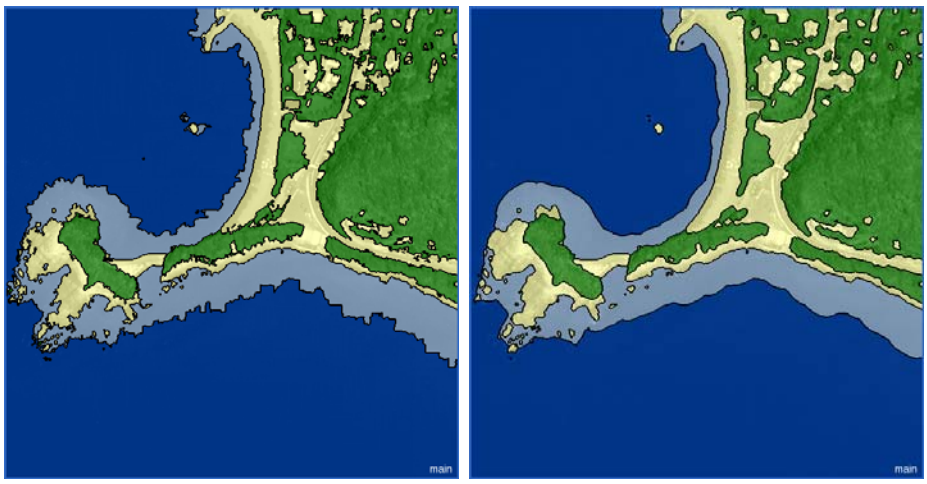
In the next example a surface tension of <0.5 and >0,5 is set to grow and shrink an object.

Information

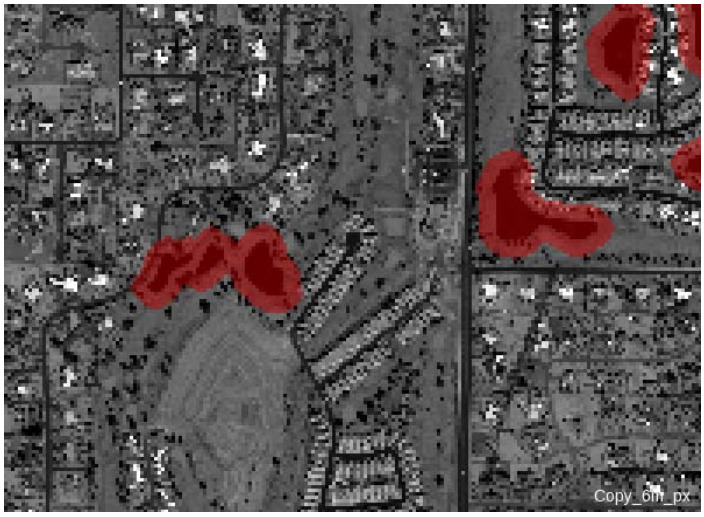
1.3 Applications

You can use this algorithm to

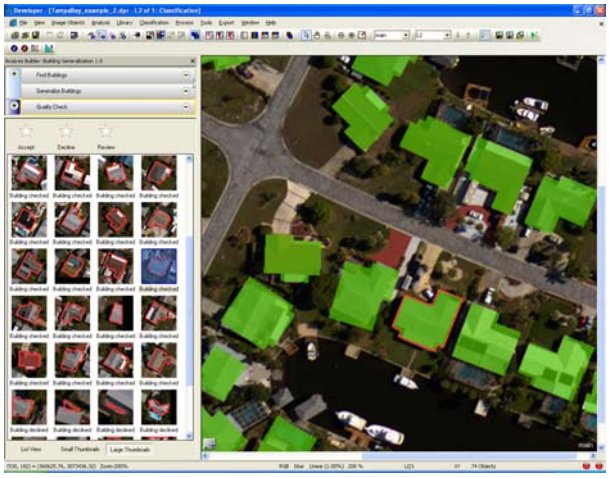
- Generalize object outlines to get a smoother vector layer output.



- Create a buffer around objects, i.e. because you want to cut a so called Region from it.



- Create square objects and grow them exactly pixel wise (part of customized algorithm downloadable from community platform http://community.definiens.com/).



Lesson 2 Generalize Object outlines – fill intrusions, cut extrusions

This Lesson covers the following content

- *Fill an intrusion with growing and surface tension*
- *Cut extrusion with shrinking and surface tension*

Introduction

The basis of the loaded project is an artificial image with the red area having an extrusion in the upper part and a intrusion in the lower part.

In the first part of this exercise you will learn how to fill the intrusion using the algorithm 'pixel-based object resizing' with mode 'growing' and a 'Candidate surface tension' set. In the second part the extrusion will be cut.

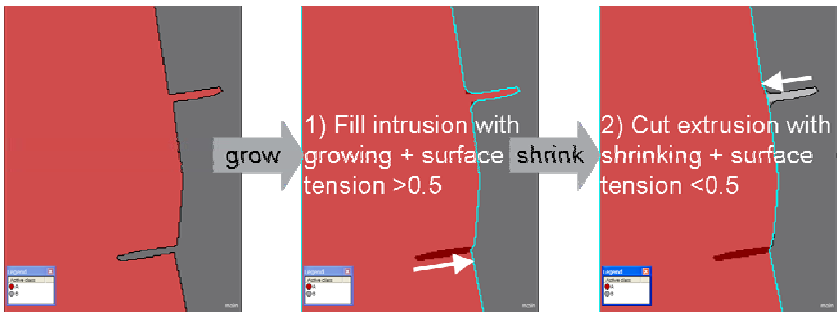


Figure 2: After growing and shrinking using the 'pixel-based resizing' algorithm, the object has a smooth outline. Extrusions are cut, intrusions are filled.

2.1 Fill an intrusion with growing and surface tension

Introduction

To fill an intrusion you can use the algorithm '**pixel-based resizing**' together with the surface tension condition, which can be set in the Parameters section of this algorithm.

To fill an intrusion the red **class 'A'** has to grow in **class 'B'**, but only if the surface tension is more than 0,5, respectively if the object covers the box with more than 50%.

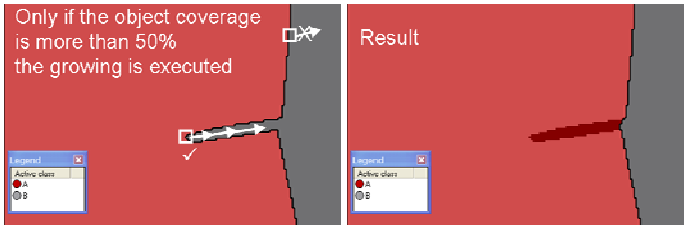


Figure 3: Before and after growing with surface tension condition.

Action!

2.1.1 Preparation

1. Start Definiens eCogniton Developer in 'Rule Set' mode.
2. Switch to predefined view setting number 4 'Develop rulesets'.

3. In the main menu 'File' choose 'Open Project' or click on the 'Open Project' button in the toolbar.

Result Check

4. Open the project '**Growing_Shrinking_Surface_Artificial.dpr**' in the folder '…\01_eCognitionDeveloper8_WhatsNew**01_Pixelbased_resizing_Object_generalization**' at the location where the training data is stored.

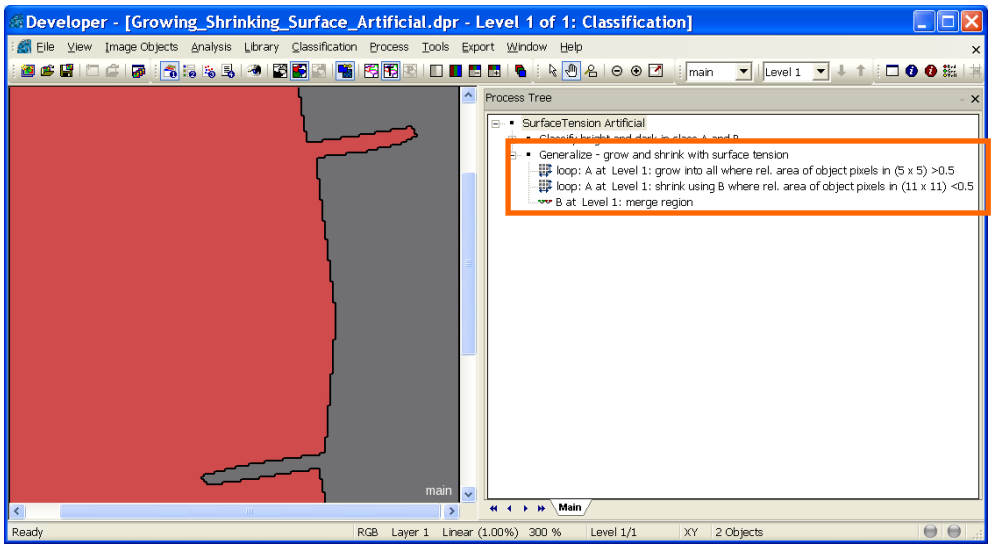


Figure 4: The Rule Set section 'Classify bright and dark in class A and B' is already executed class A and class B are classified. The objects are merged.

Information

2.1.2 Process settings to fill the intrusion

Action!

The second process sequence '**Generalize - grow and shrink with surface tension**' contains the steps to generalize the outlines of the red class 'A'. I the next chapters explain the individual settings of the Processes.

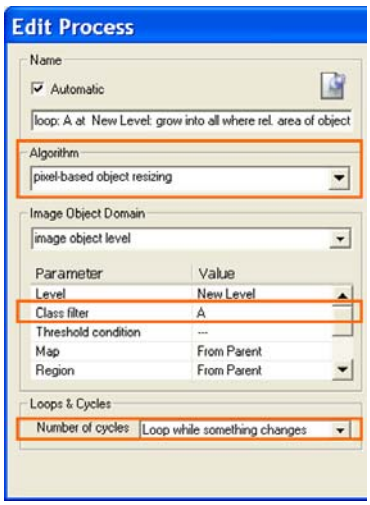
1. Expand the Parent Process '**Generalize - grow and shrink with surface tension**'.
2. Double-click on the first Child Process '**loop: A at Level 1: grow into all where rel. area of object pixels in (5 x 5) >0.5**' to open it.

- As algorithm 'pixel-based object resizing' is chosen, this algorithm is part of the algorithm category 'Pixel-Based Reshaping'.

Settings Check

Image Object Domain and Looping

- In the field '**Class filter'** class '**A**' is chosen. This defines that Objects of class 'A' will be resized.
- In the field 'number of cycles' '**loop while something changes**' is set. Otherwise the procedure will stop after only adding one row of fitting pixels.



Algorithm Parameters, mode and condition

This Process shall **fill an intrusion**, respectively **grow the class 'A'** until the surface tension condition is met.

Settings Check

- In the field 'Mode' '**Growing**' is chosen from the drop-down list.

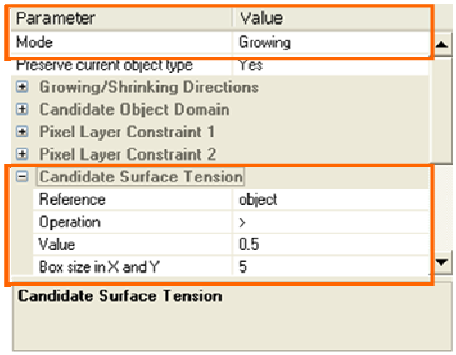


Figure 5: Parameters settings for growing with surface tension to fill intrusions.

- The fields 'Growing/Shrinking Directions', 'Candidate Object domain' and both 'Pixel Layer Constraint' are not used in this Process or the default settings are kept.

In the section '**Candidate Surface Tension**' the condition for growing is set.

- In the field 'Reference' 'object' is chosen from the drop-down list. This defines that the coverage in relation to the Object is calculated.
- As operation larger than **>** is chosen and as value **0.5**. This defines that the growing is only executed, if the coverage of the object in the box is more than 50%.
- The default box size **5** is kept.

All these settings together have the effect that if the 5*5 box is covered with **more than 50% of the object**, a row of pixels will be added. If the box is covered with equal or less 50%, nothing is executed.

Action!

2.1.3 Execute the Process and review the result

1. **Close** the 'Edit Process' window.
2. **Execute** the Process, by either right-clicking on it and select 'Execute' from the context menu or by selecting it and pressing F5 on your keyboard.
3. Switch on the classification view and/or the outlines to see the new outline of class 'A'.

Result Check

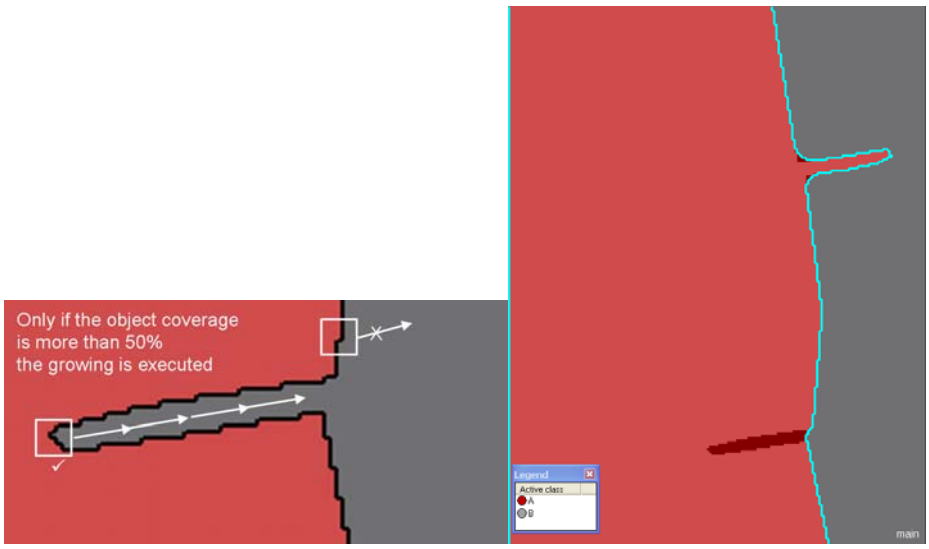


Figure 6: Before and after growing with surface tension condition.

Rule Set Check

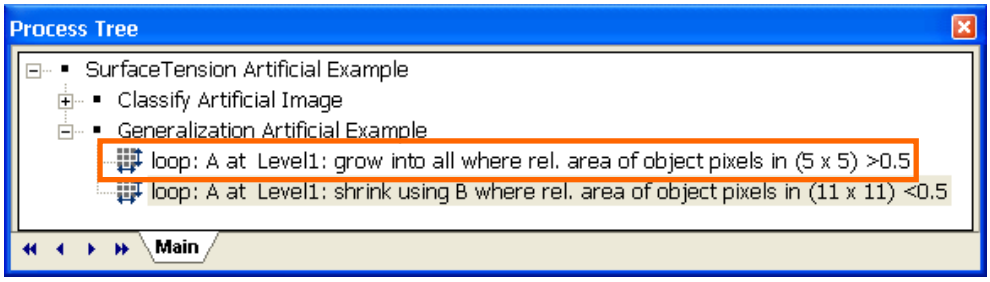


Figure 7: Process to fill intrusions highlighted.

Information

2.2 Cut extrusion with shrinking and surface tension

Action!

In a second step the class 'A' is shrunken, but only if the surface tension is **less than 0,5**, respectively if the box is covered with less than 0,5 by the object. In opposite to the growing procedure **a larger box size** is used. If the box size is too small, the extrusion **will not completely** be removed.

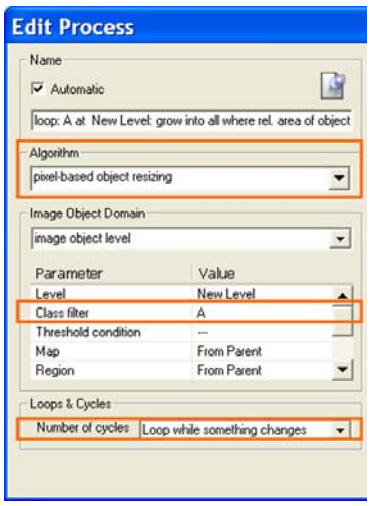
1. Double-click on the second Child Process '**loop: A at Level 1: shrink using B where rel. area of object pixels in (11 x 11) <0.5**' to open it.

2.2.1 Process Settings to cut extrusion

Image Object Domain and Looping

Settings Check

- In the field 'Class filter' class '**A**' is chosen. This is set, because again the objects of class 'A' are resized, as in the Process before.
- In the field 'number of cycles' '**loop while something changes**' is set. Otherwise the procedure will stop after only adding one row of fitting pixels.



Algorithm Parameters, mode and condition

Settings Check

This Process shall **cut an extrusion**, respectively **shrink the class 'A'** until the surface tension condition is met.

- In the field 'Mode' '**Shrinking**' is chosen from the drop-down list.
- In the field '**Class for new image objects**' class '**B**' is defined. This has the effect that cut pixels are right away assigned to class 'B'.

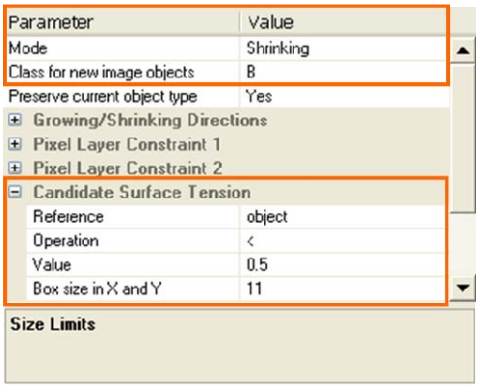


Figure 8: Parameters settings for shrinking with surface tension to cut extrusions.

- The fields 'Growing/Shrinking Directions', 'Candidate Object domain' and both 'Pixel Layer Constraint' are not used in this Process or the default settings are kept.

In the section '**Candidate Surface Tension**' the condition for growing is set.

- In the field 'Reference' '**object**' is chosen from the drop-down list, same as in the Process before.
- As operation **lower than < is chose** .and as value **0.5** is set.
- The box size is increased to **11**.

This has the effect that if the 11*11 box is covered with **less than 50% of the object**, a row of pixels will be cut and assigned to the class 'B'. If the box is covered with equal or more than 50%, nothing happens.

Action!

2.2.2 Execute the Process and review the result

1. **Close** the 'Edit Process' window.
2. **Execute** the Process, by either right-clicking on it and select 'Execute' from the context menu or by selecting it and pressing F5 on your keyboard.
3. Switch on the classification view and/ or the outlines to see the new outline of class 'A'

Result Check

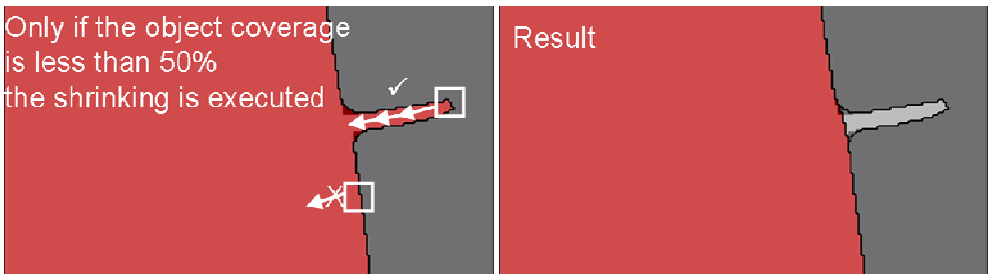


Figure 9: Before and after executing the shrinking Process with surface tension condition.

Rule Set Check

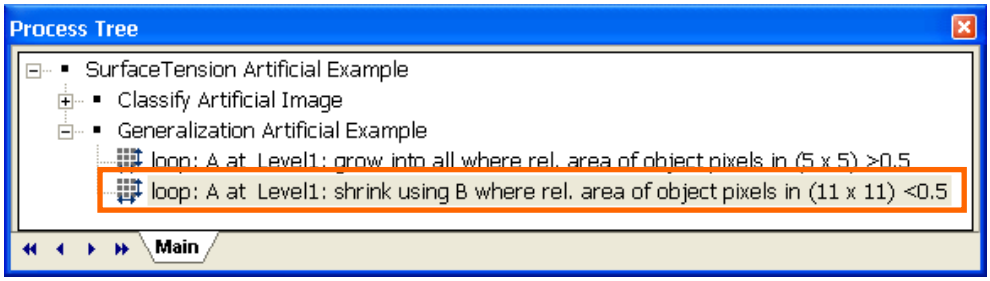


Figure 10: Process Tree showing the added Process to cut extrusions.