Turtle Plots

Moving the Turtle

- Idea: trace walk-path

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C++ Easy Commands

• Step (drawn):	`ifmp::forward();`
• Rotation left:	`ifmp::left(my_angle);`
• Rotation right:	`ifmp::right(my_angle);`

Requires: `#include <IFMP/turtle>`

Moving the Turtle

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ifmp::forward();
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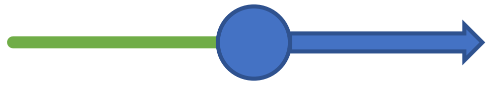

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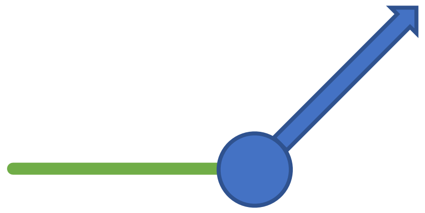

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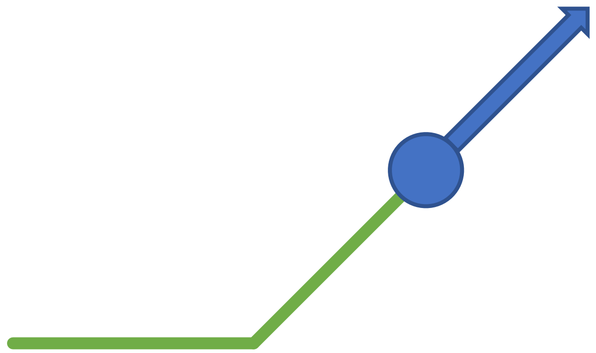

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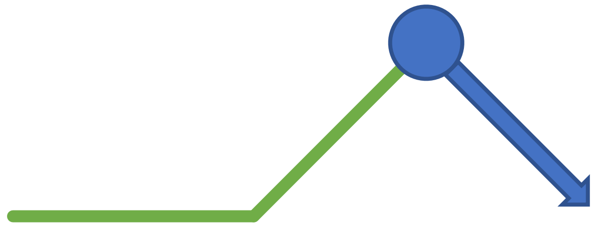

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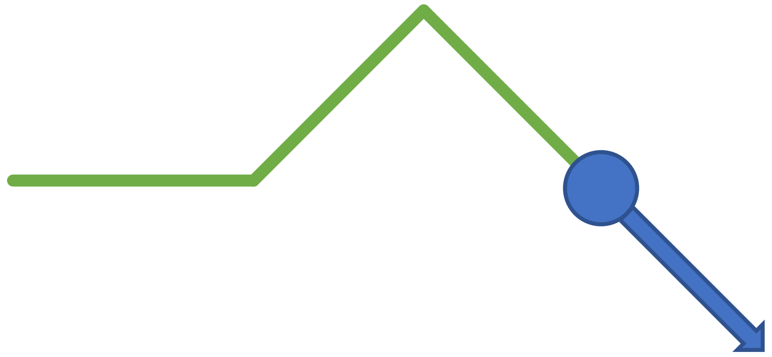

Lindenmayer Systems

Lindenmayer Systems

- Characterized by three things:
    1. Alphabet Σ - the allowed symbols
    2. Production P - how to replace each symbol
    3. Initial word s - the word to start with

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2.	Production P	-	how to replace each symbol
3.	Initial word s	-	the word to start with

- Example:

1. $\Sigma := \{F, +, -\}$
2. $P := \begin{cases} F & \mapsto & F+F+ \\ + & \mapsto & + \\ - & \mapsto & - \end{cases}$
3. $s := F$

Lindenmayer Systems

- How does it look after 3 rounds?

1. $\Sigma \coloneqq \{F, +, -\}$
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s: F

w_1:

w_2:

w_3:

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Draw Lindenmayer Systems

Two Step Procedure

- Goal: Draw n-th step of Lindenmayer system

- Done in 2 steps
    1. Obtain n-th step
    2. Draw it

Step 1 – Obtain n-th Word

- Write and use the following two functions
  - **`std::string production (const char c)`**
    - In: symbol e.g. `F`
    - Out: its production e.g. `F+F+`

Step 1 – Obtain n-th Word

- Write and use the following two functions

  - **`std::string production (const char c)`**
    - In: symbol e.g. `F`
    - Out: its production e.g. `F+F+`

  - **`std::string next_word (const std::string& word)`**
    - In: w_n (Word of step `n`) e.g. `FF`
    - Out: w_{n+1} (Word of step `n+1`) e.g. `F+F+F+F+`
    - Applies `production` to each character in w_n and concatenates the results.

Step 2 – Draw It

- Idea: view alphabet as turtle commands

- Example:

Alphabet: $\Sigma \coloneqq \{F,\ +,\ -\}$

F	`ifmp::forward()`
$+$	`ifmp::left(90)`
$-$	`ifmp::right(90)`