A Theory of User-interaction Objects

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Problem Definition

How to define user interface systems so that

- They can be described formally using precise mathematical notation
- Their behavior and properties can be methodically evaluated

User Experience

User Interfaces are an important part of the user experience.
They directly affect the users ability to analyze and understand the information presented.

But

They are way too complicated!

Motivation

Taking a mathematical approach to UI design helps us:

- Provide useful indicators and guidelines to UI designers during design refinement phase

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Taking a mathematical approach to UI design helps us:

- Provide useful indicators and guidelines to UI designers during design refinement phase
- Create better automated tools for UI design and testing
- Create more reusable UI elements

Previous Works

B. A. Myers, ACM Transactions on Information Systems 8, 289-320

A new Model for handing input

J. Foley et al. (1991) UIDE

An Intelligent User interface design environment

L. Cinque et al. (1990)

Towards a formal specification methodology for iconic interface design

What is a UIS?

Every Application has 3 major components.

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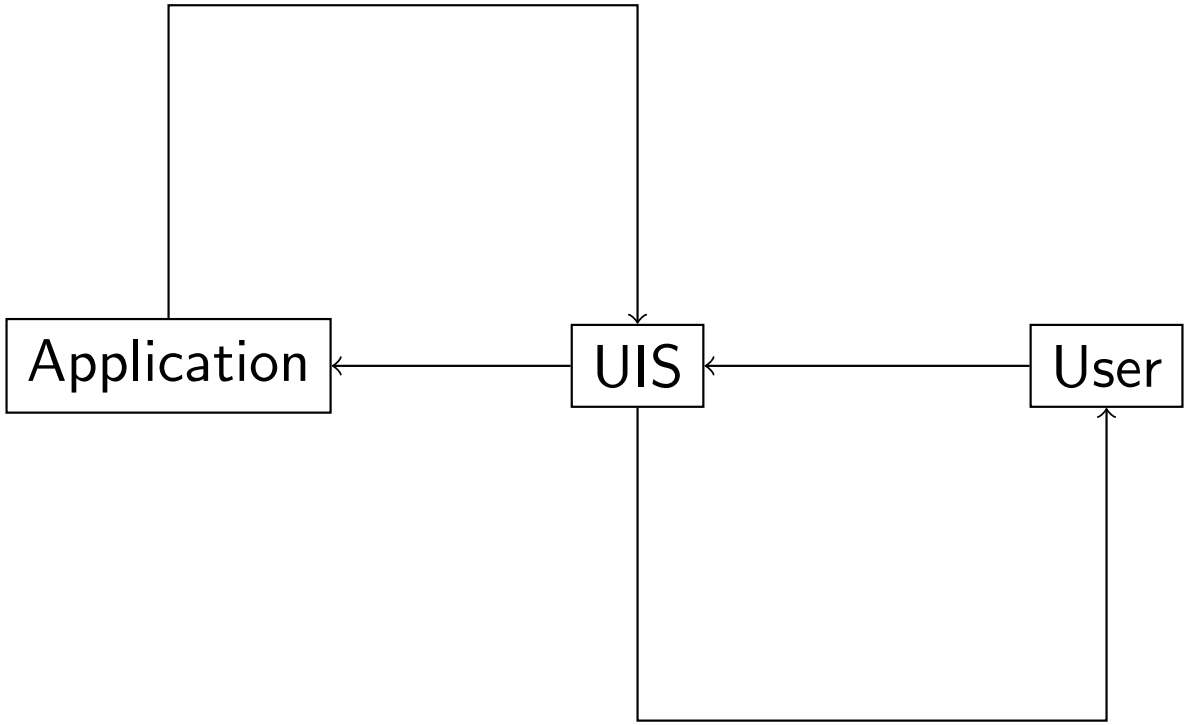


Building Block of a UIS : Interactor

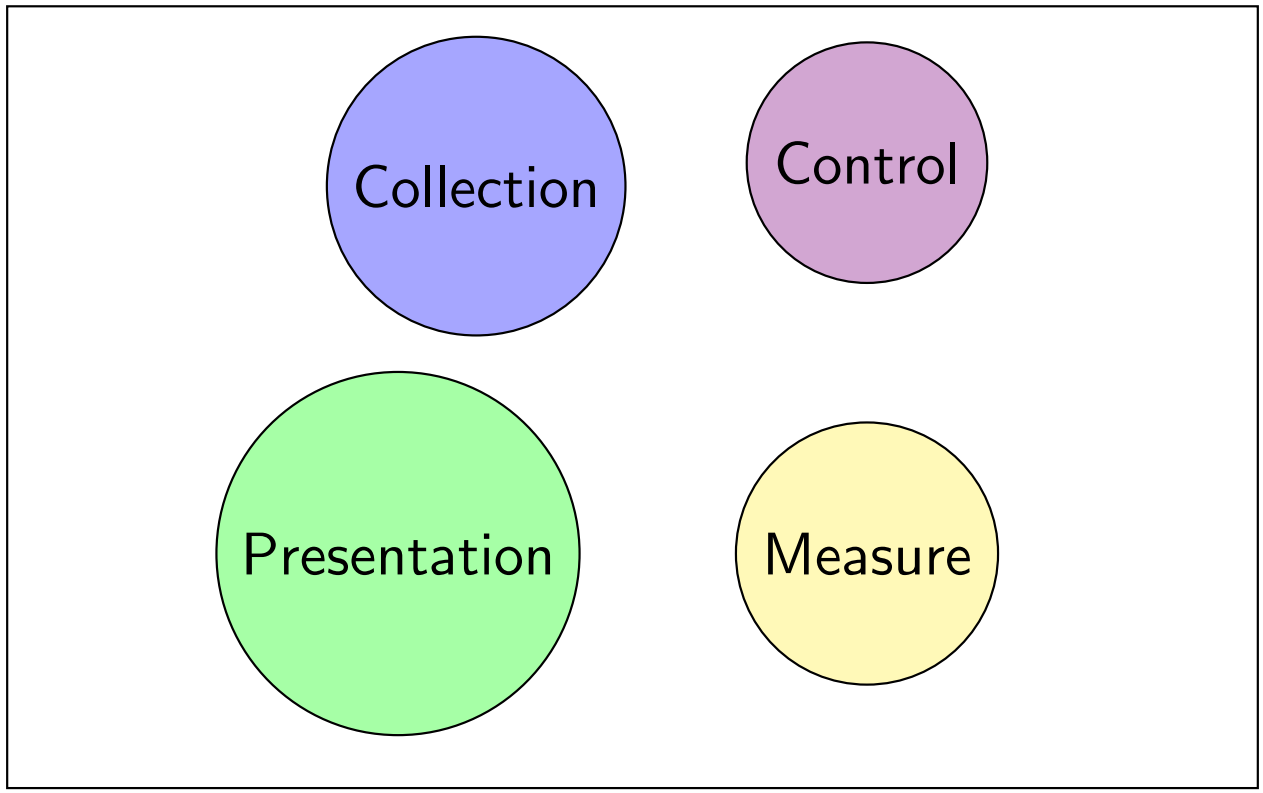
As we can see UIS is the component that communicates between the user end and the application end.Each UIS is basically a composition of a much smaller components.
And we are calling it the **'Interactor'**

Architectural Model of an Interactor

An Interactor consists of 4 architectural components.

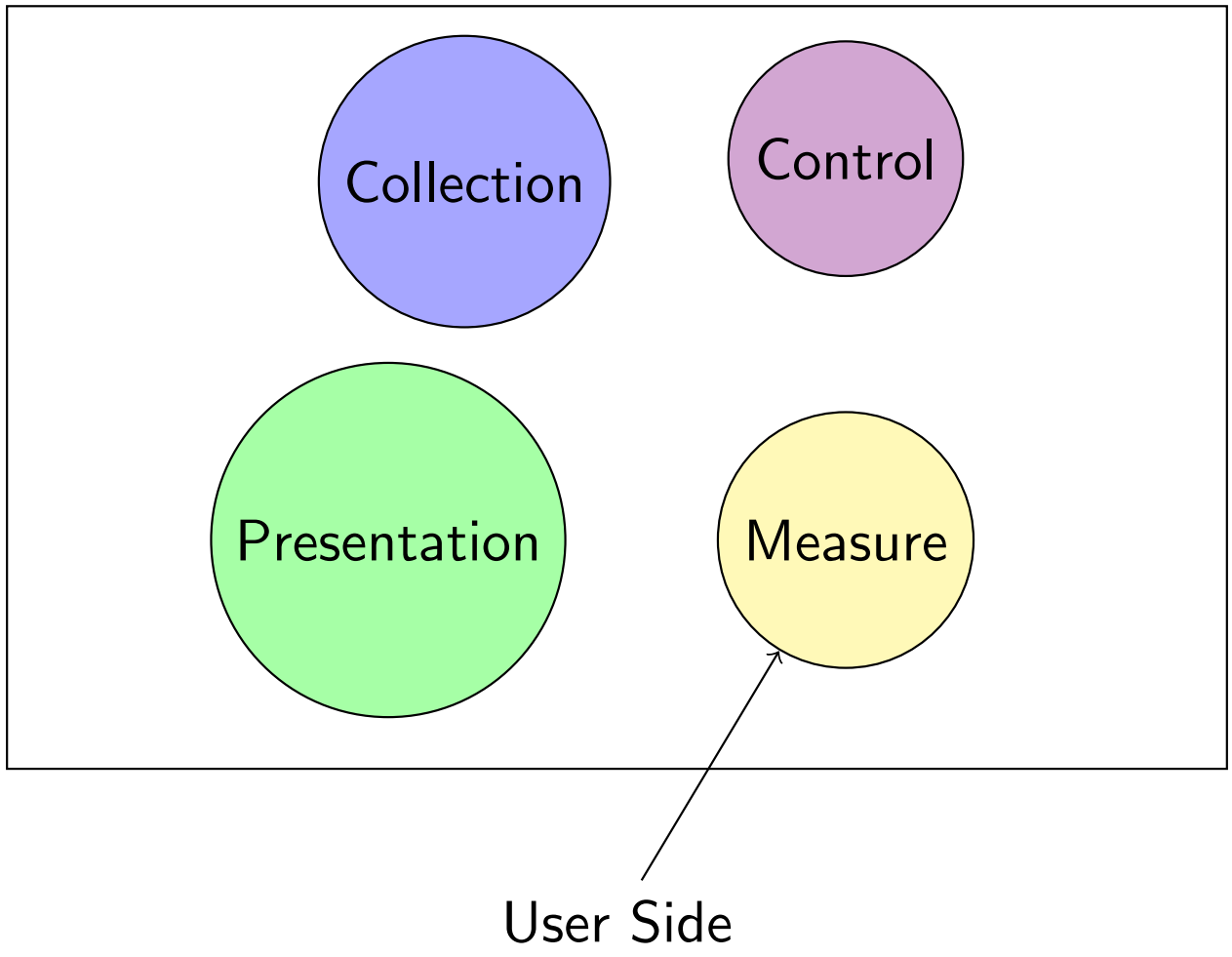
- Measure
- Control
- Collection
- Presentation

Application Side



User Side

Application Side



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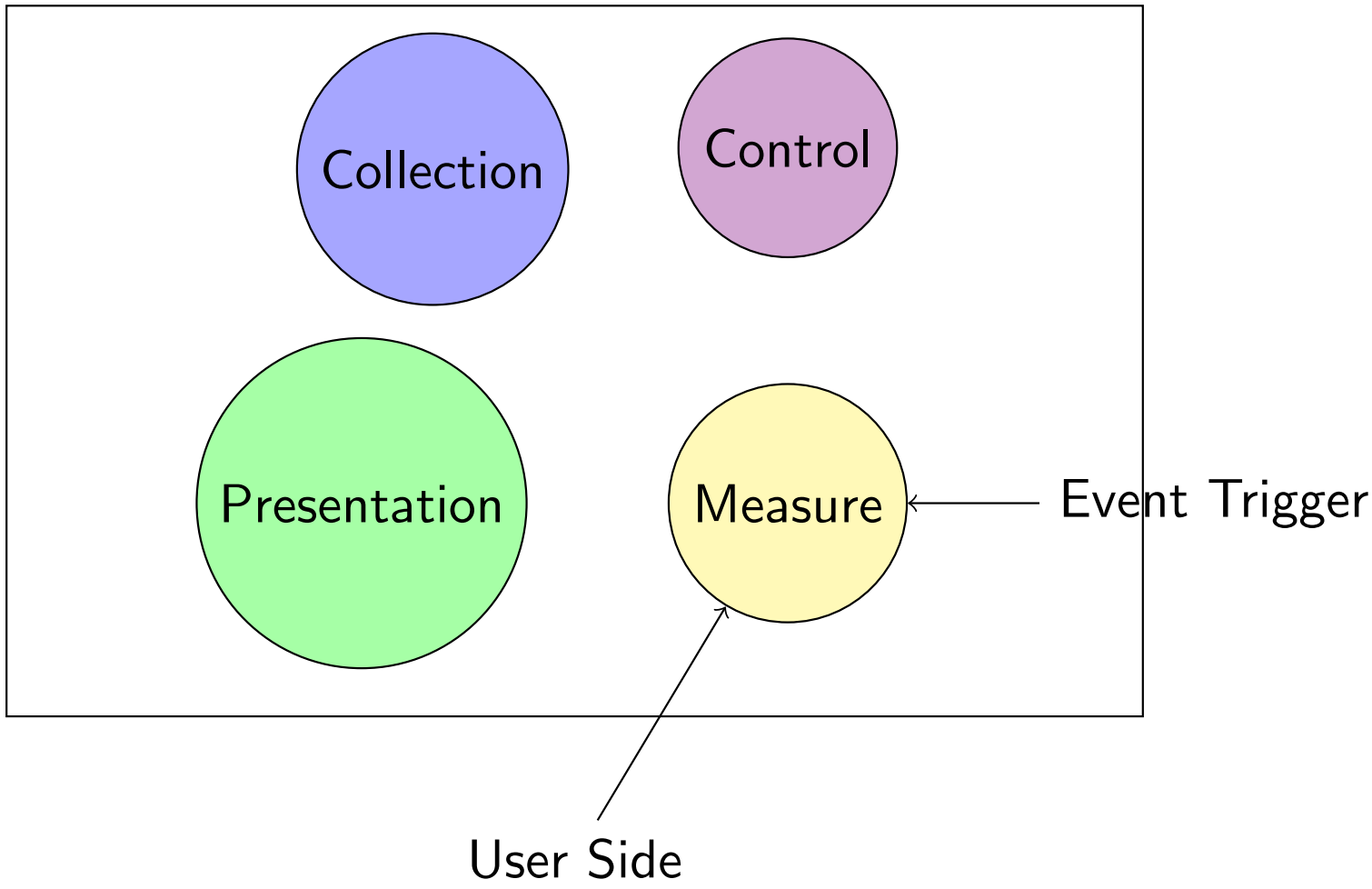

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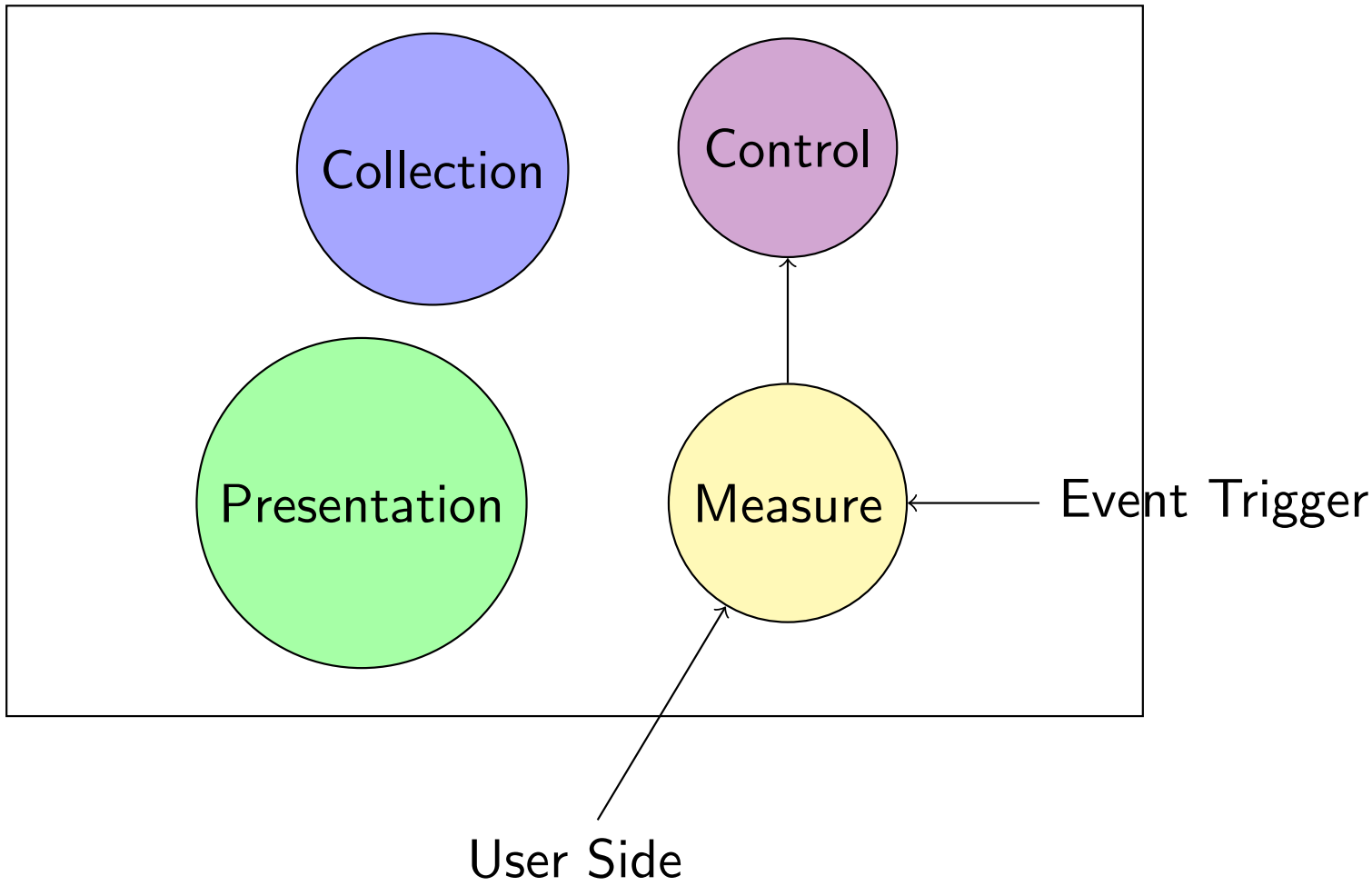

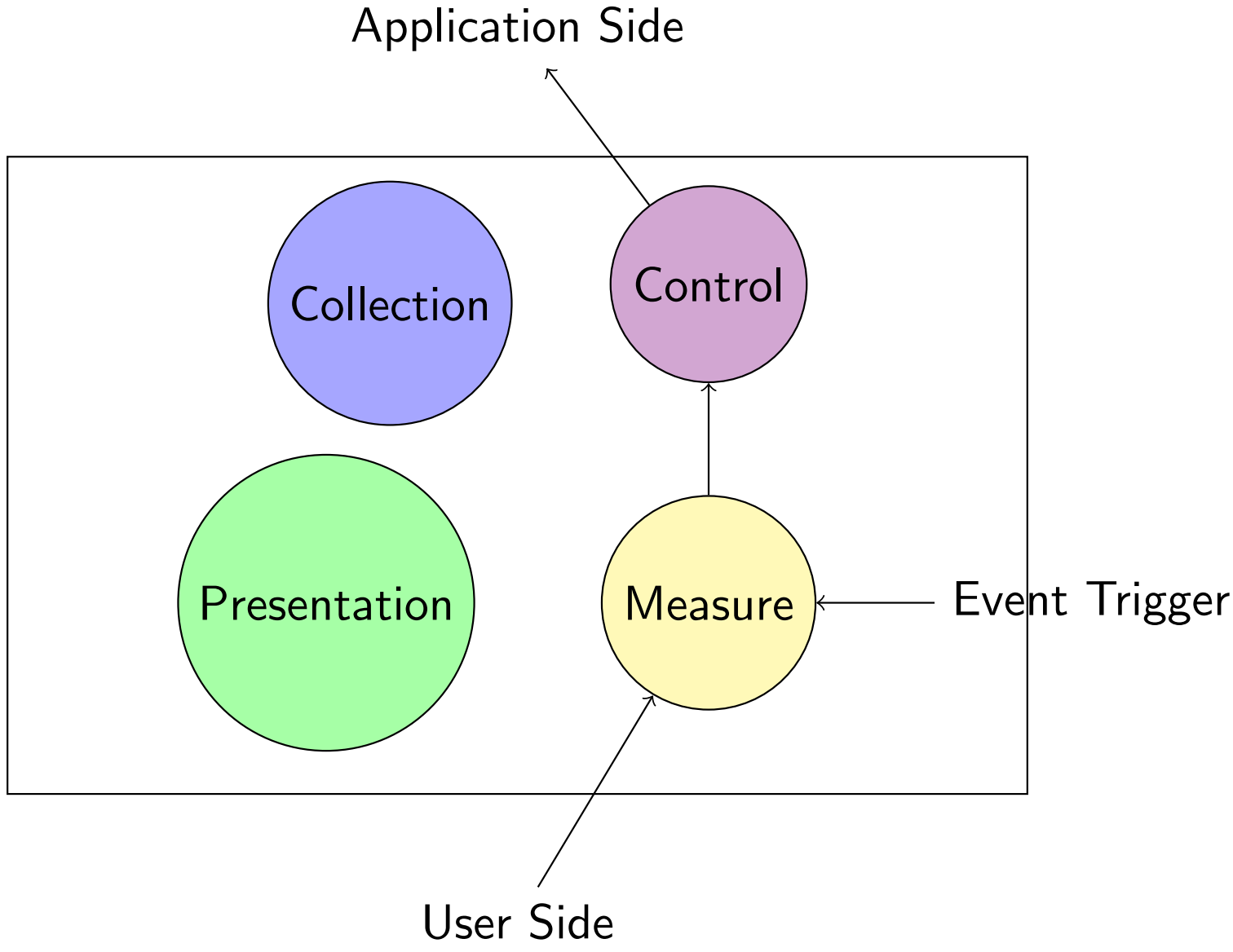
Application Side
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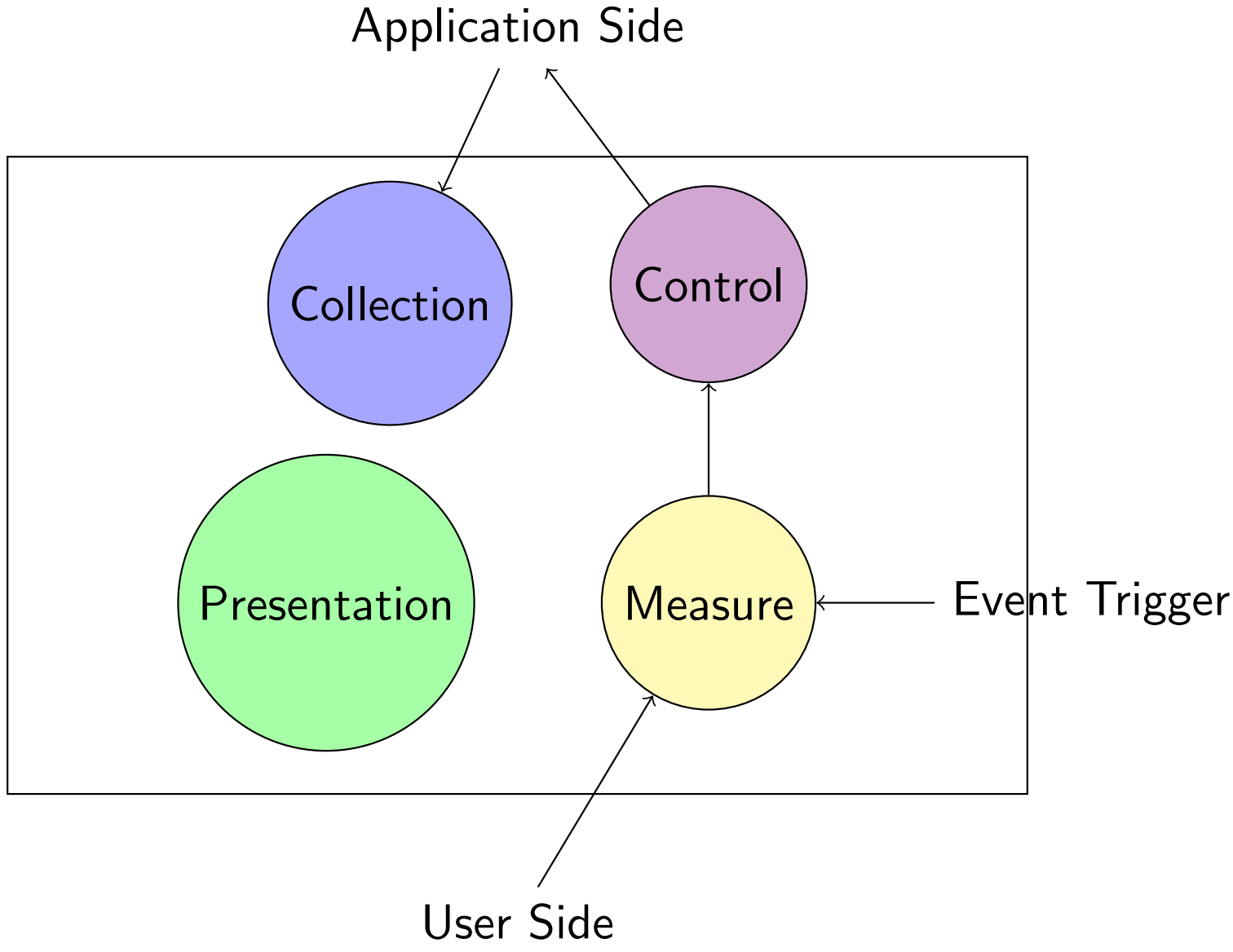
Presentation
Measure
Event Trigger
User Side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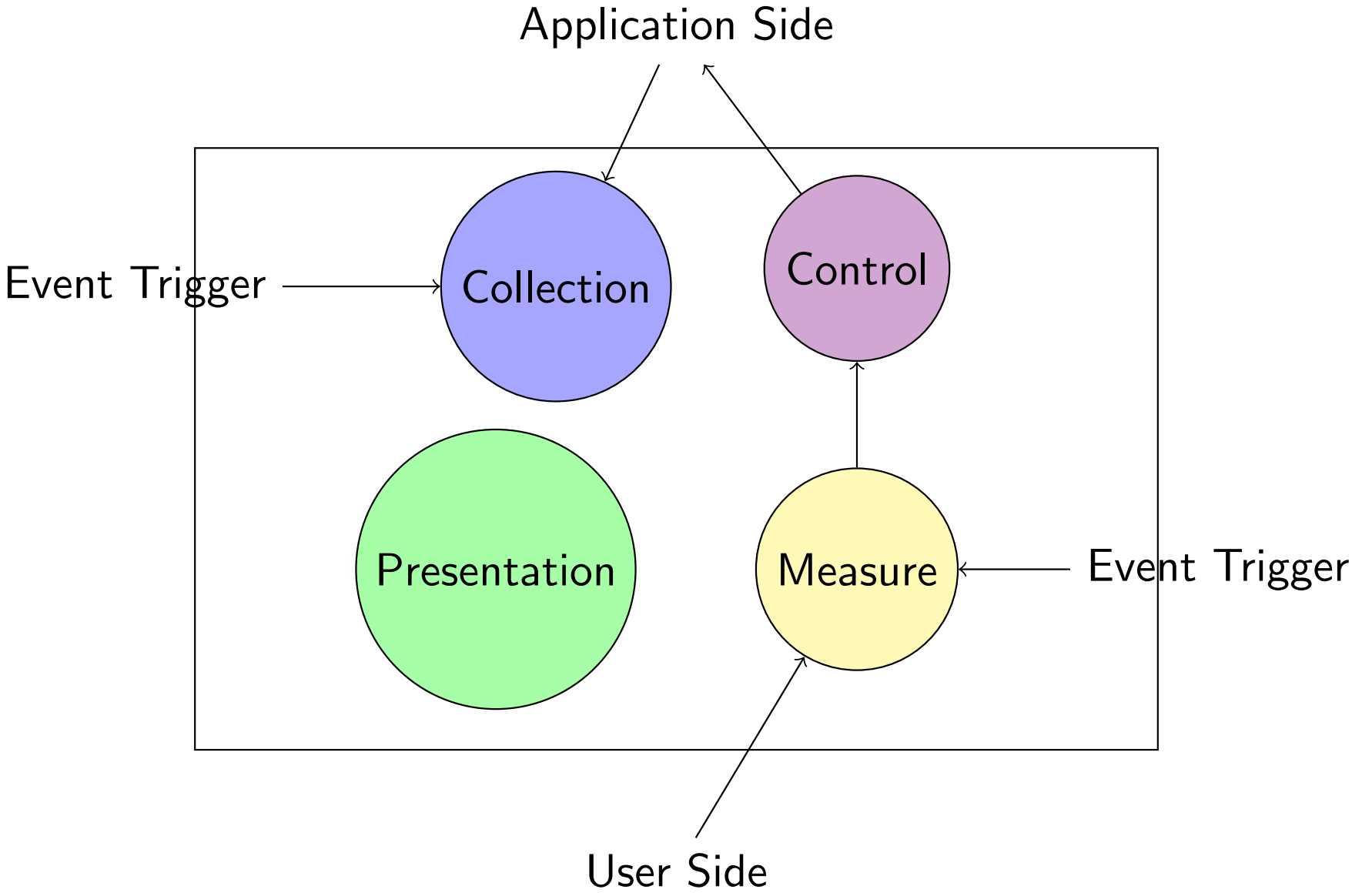
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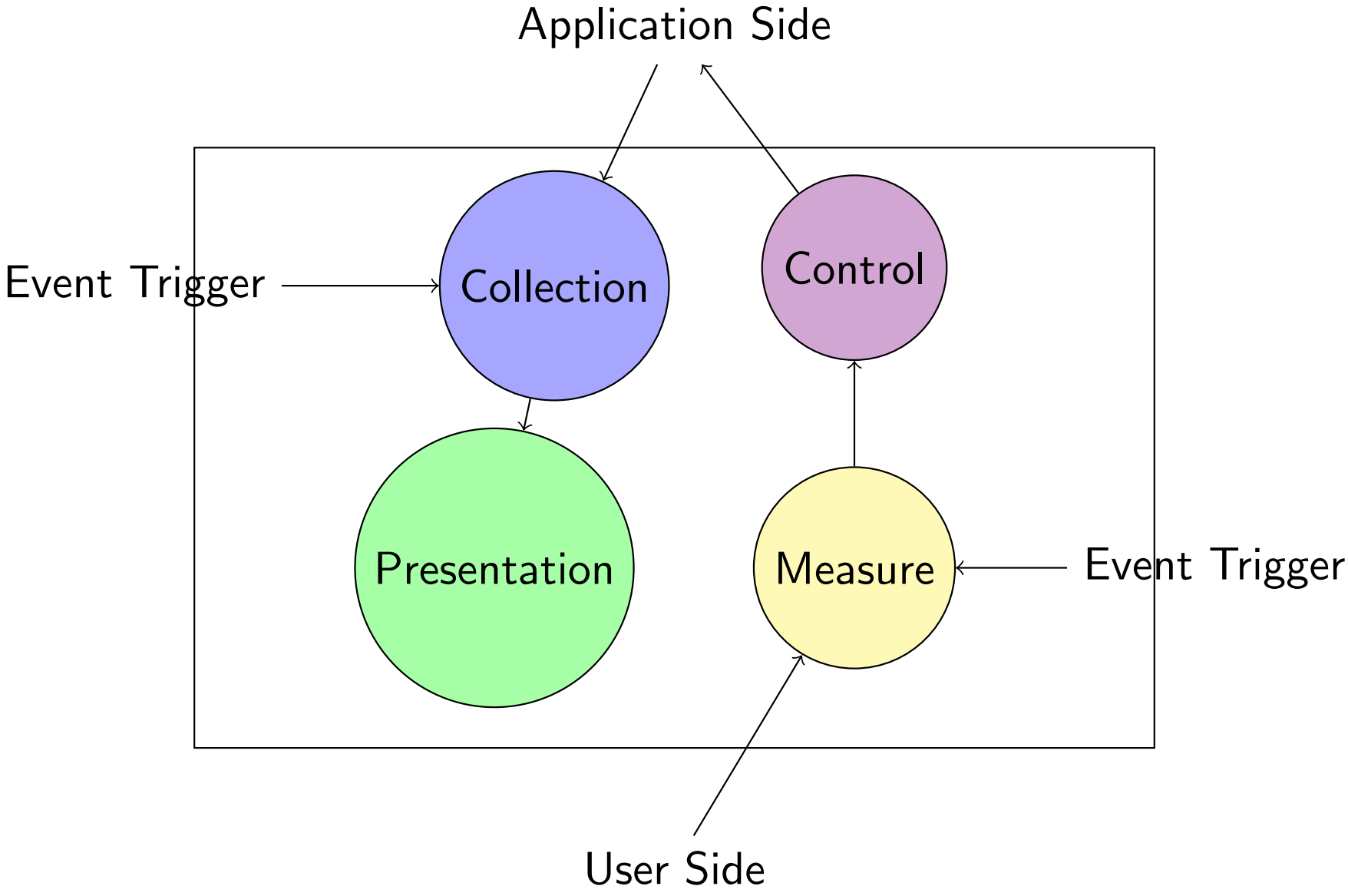
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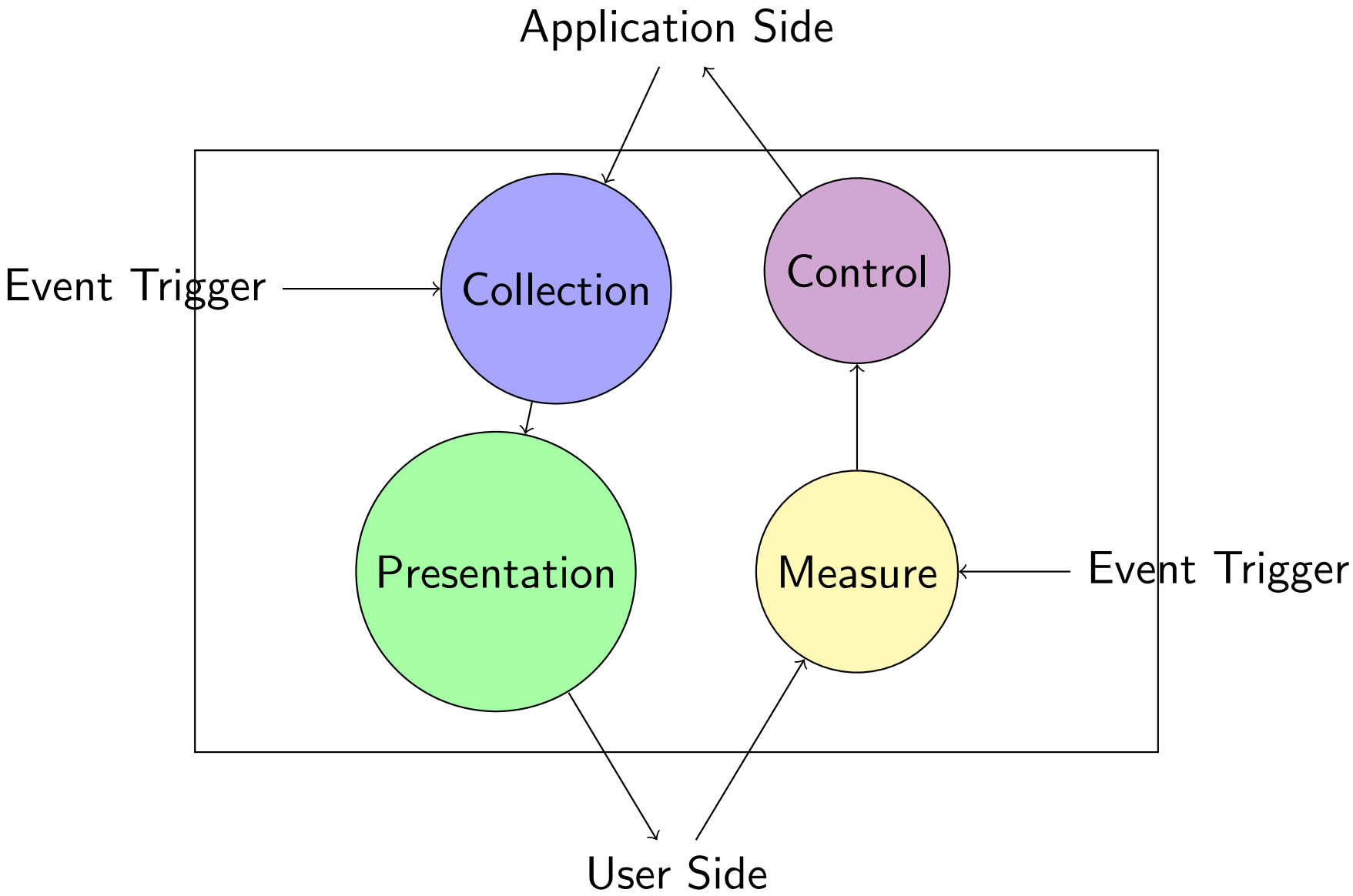
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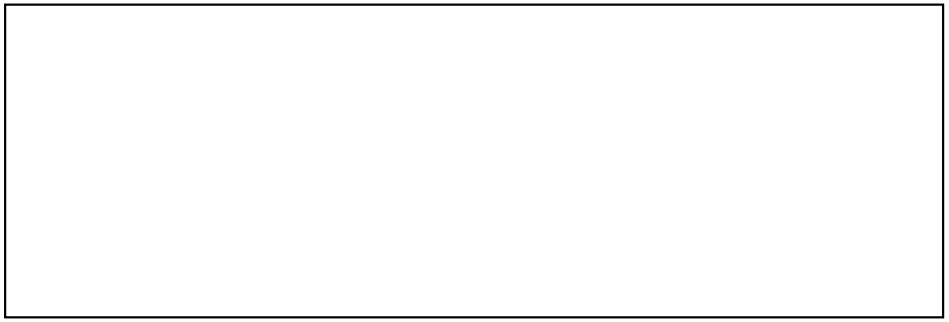
How it works?

Application Side



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User Side

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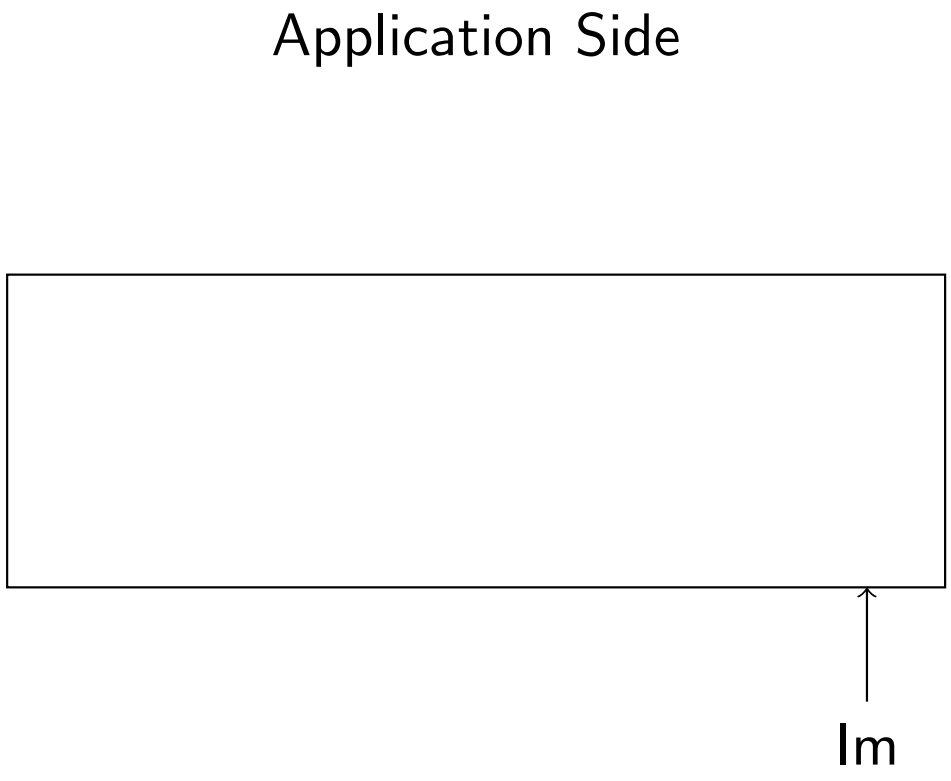

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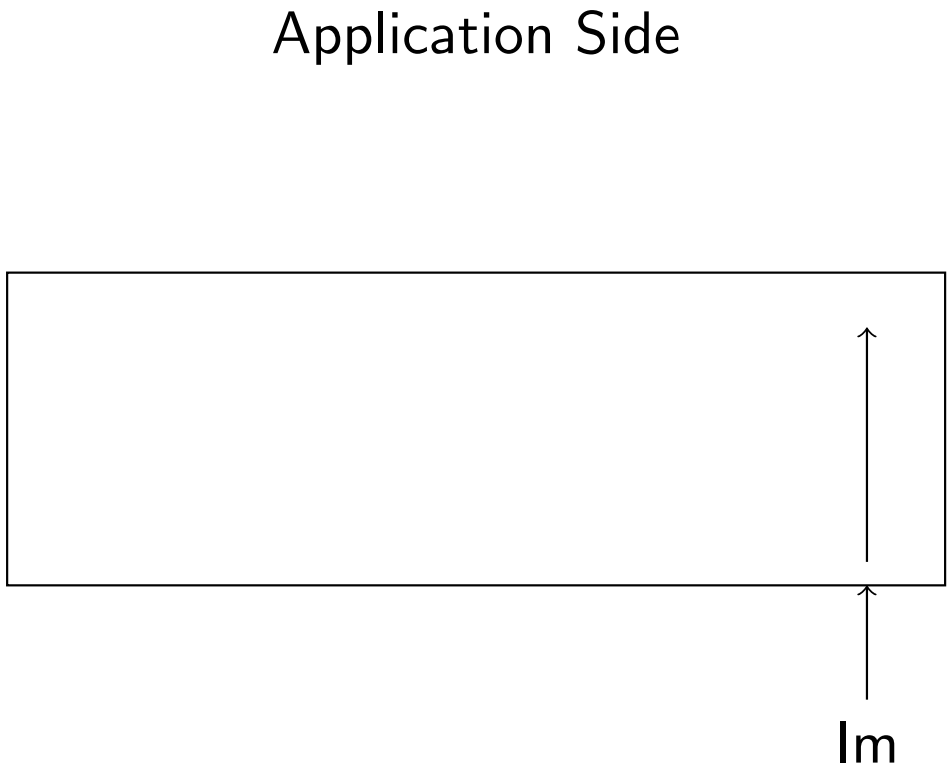

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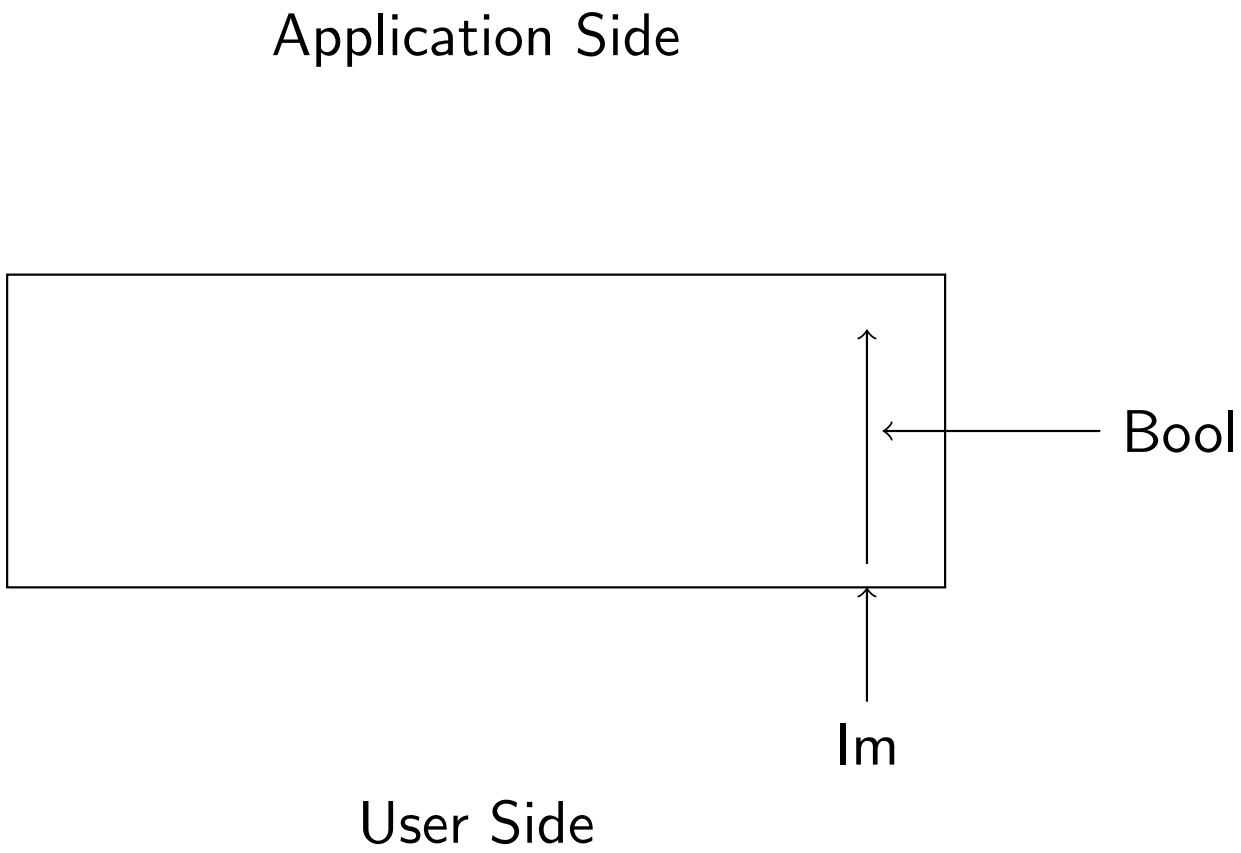

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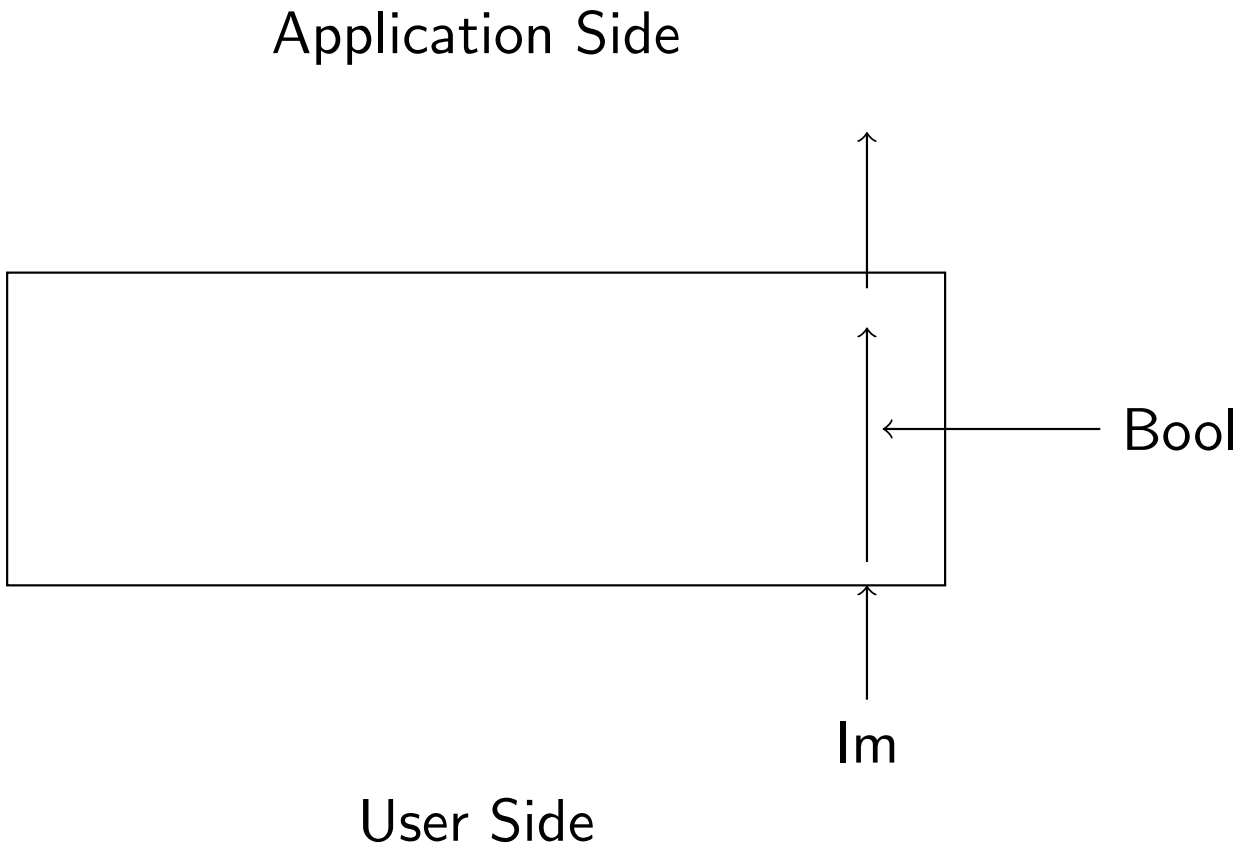

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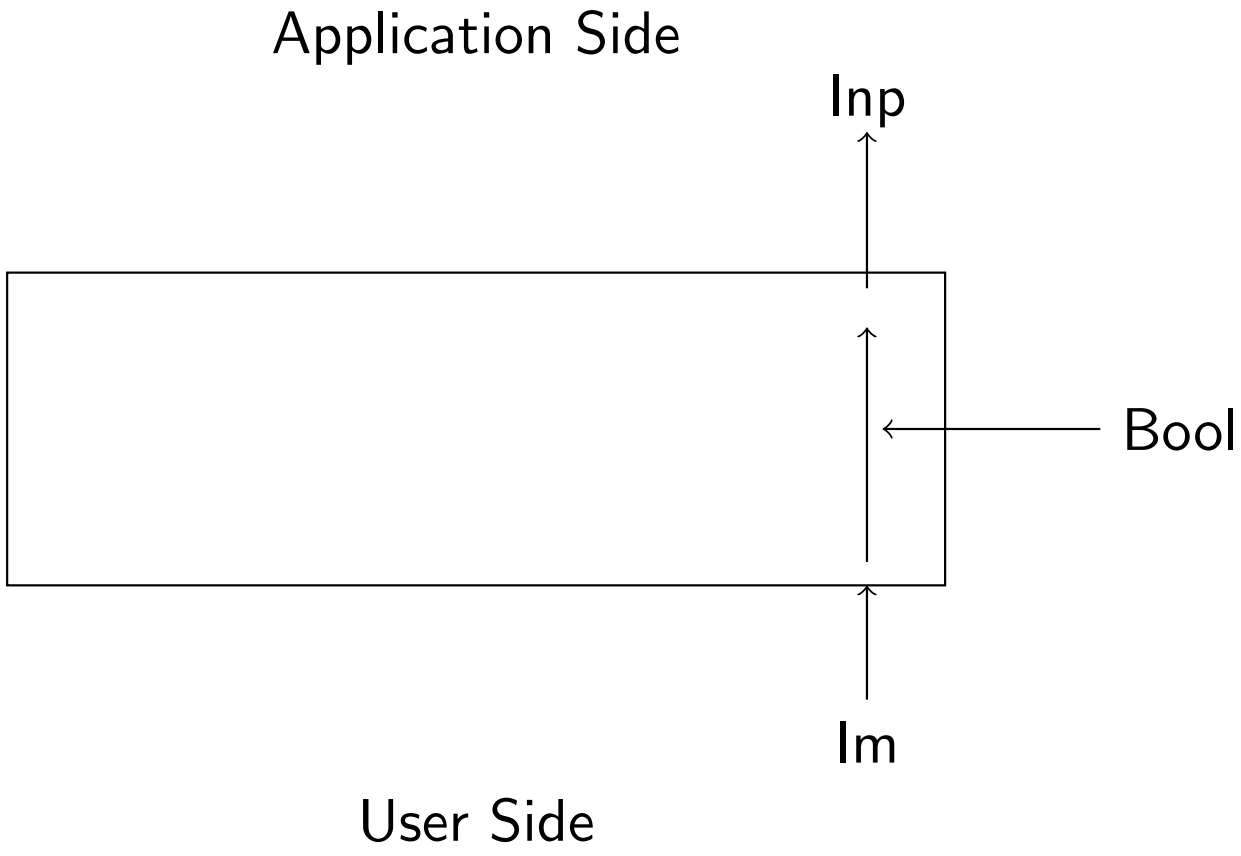

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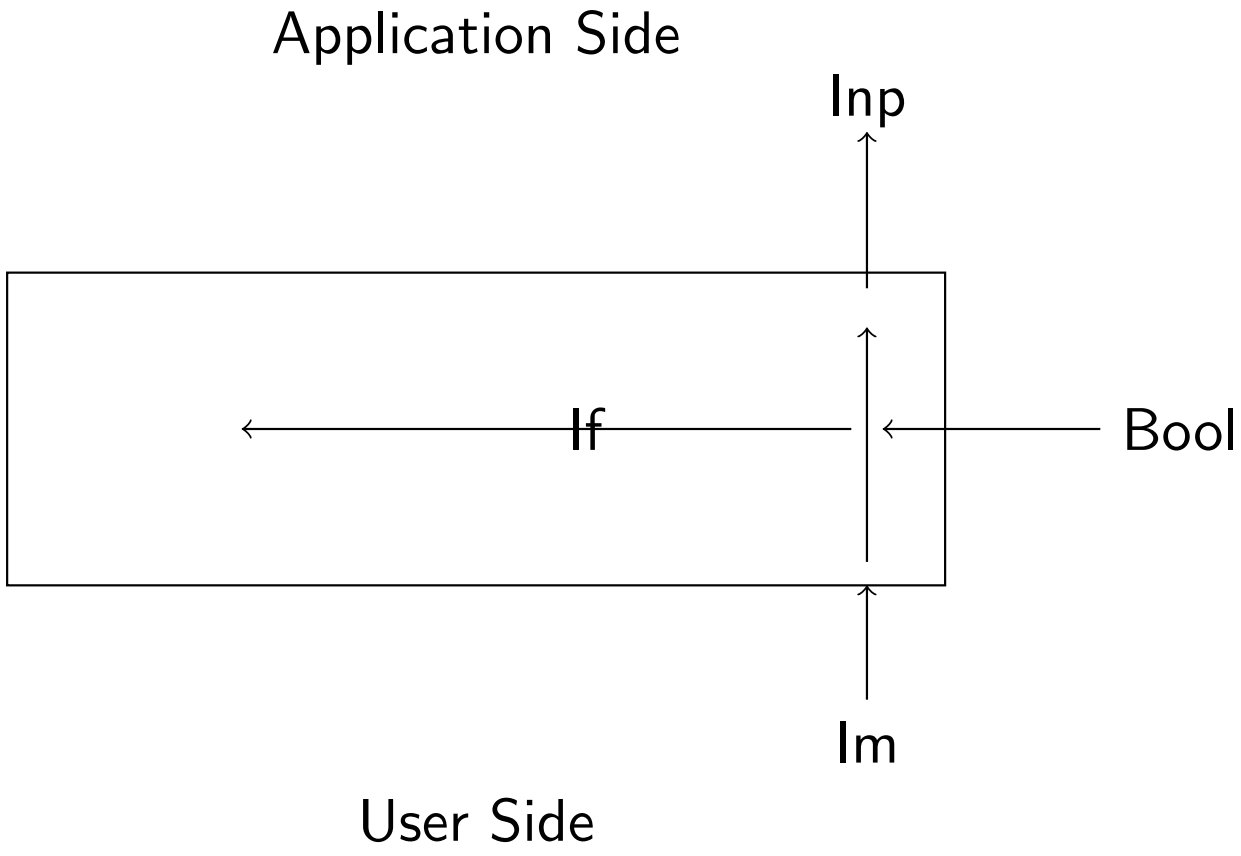

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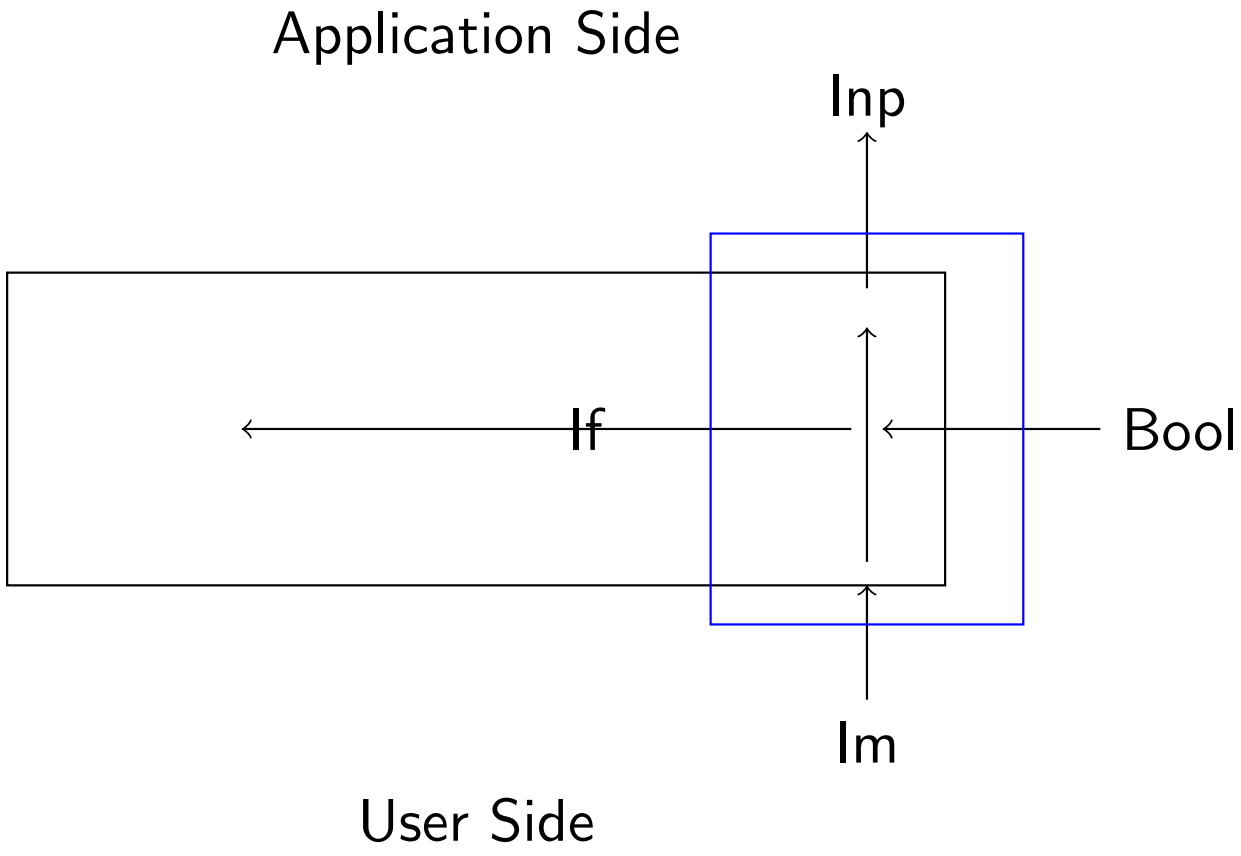
- Input Function



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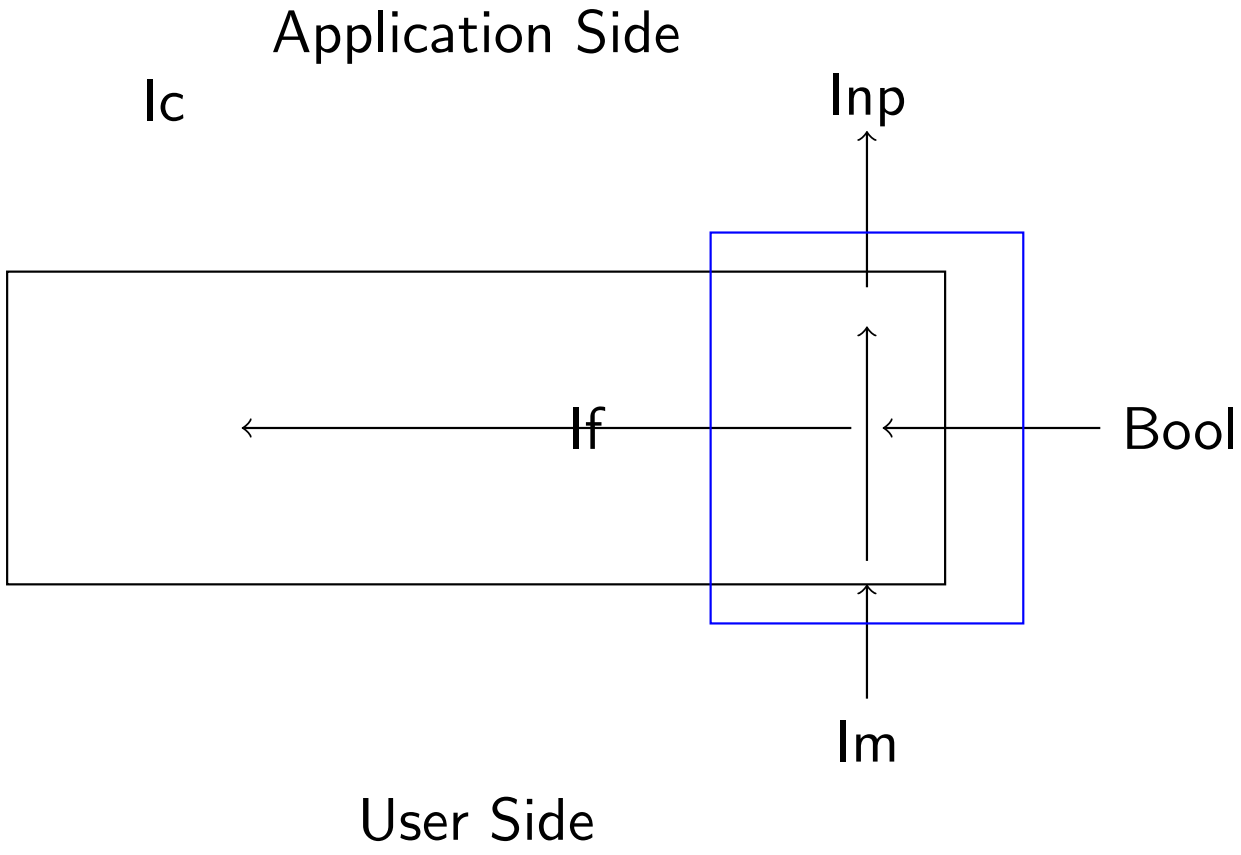

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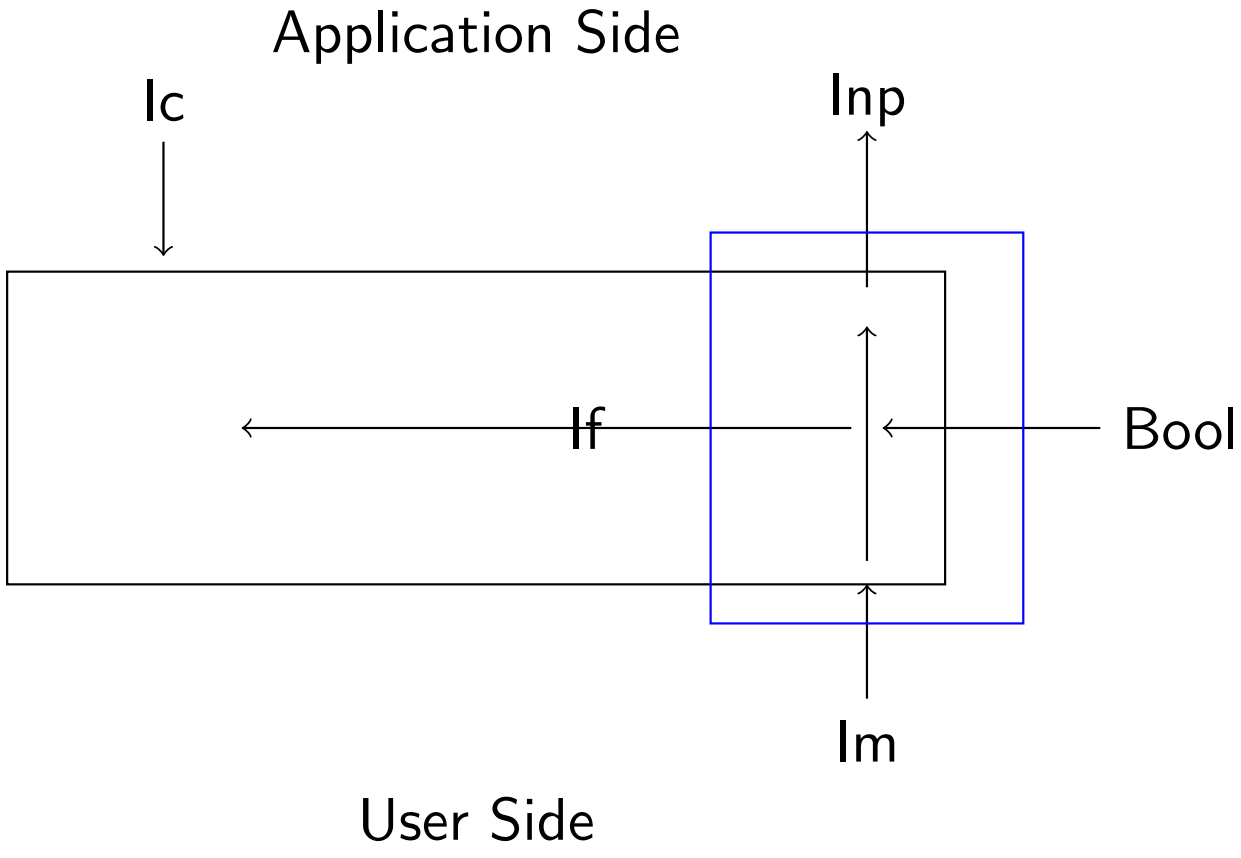

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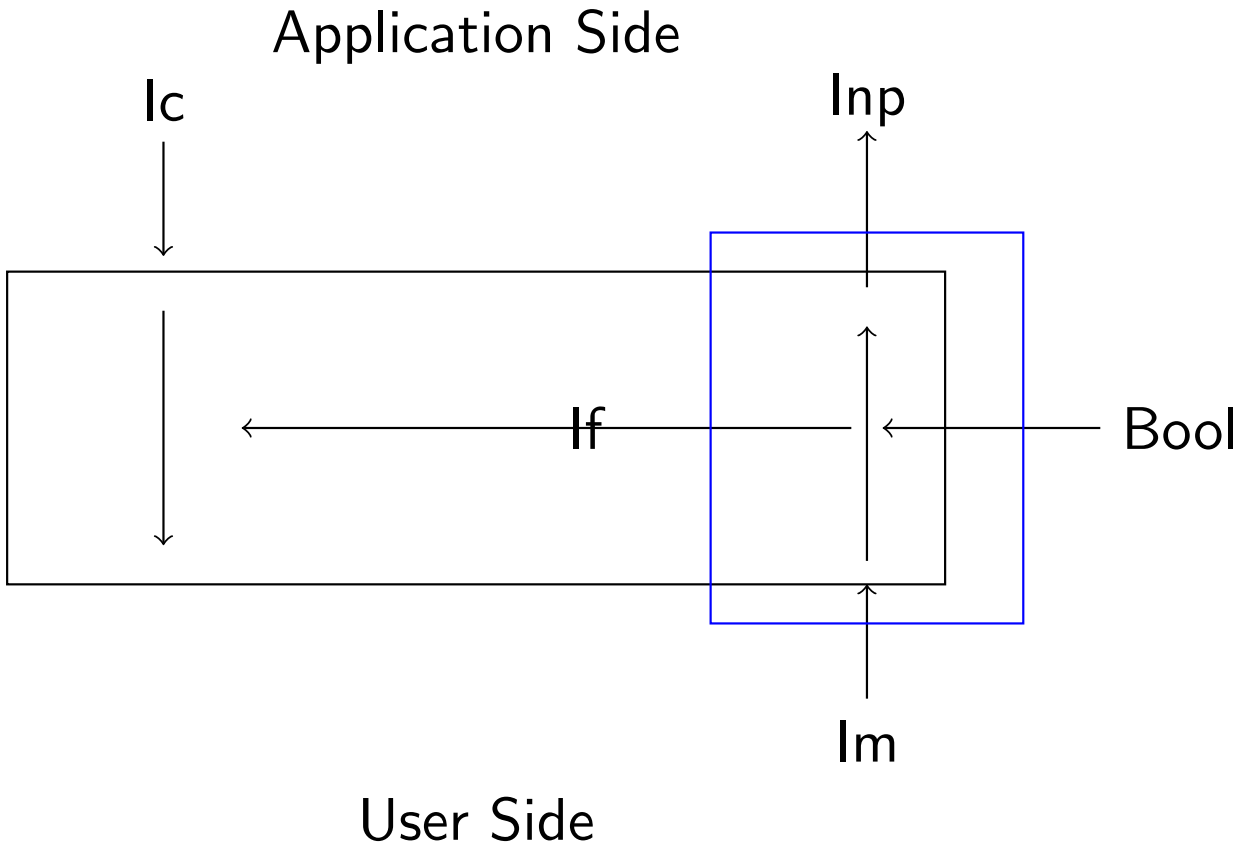

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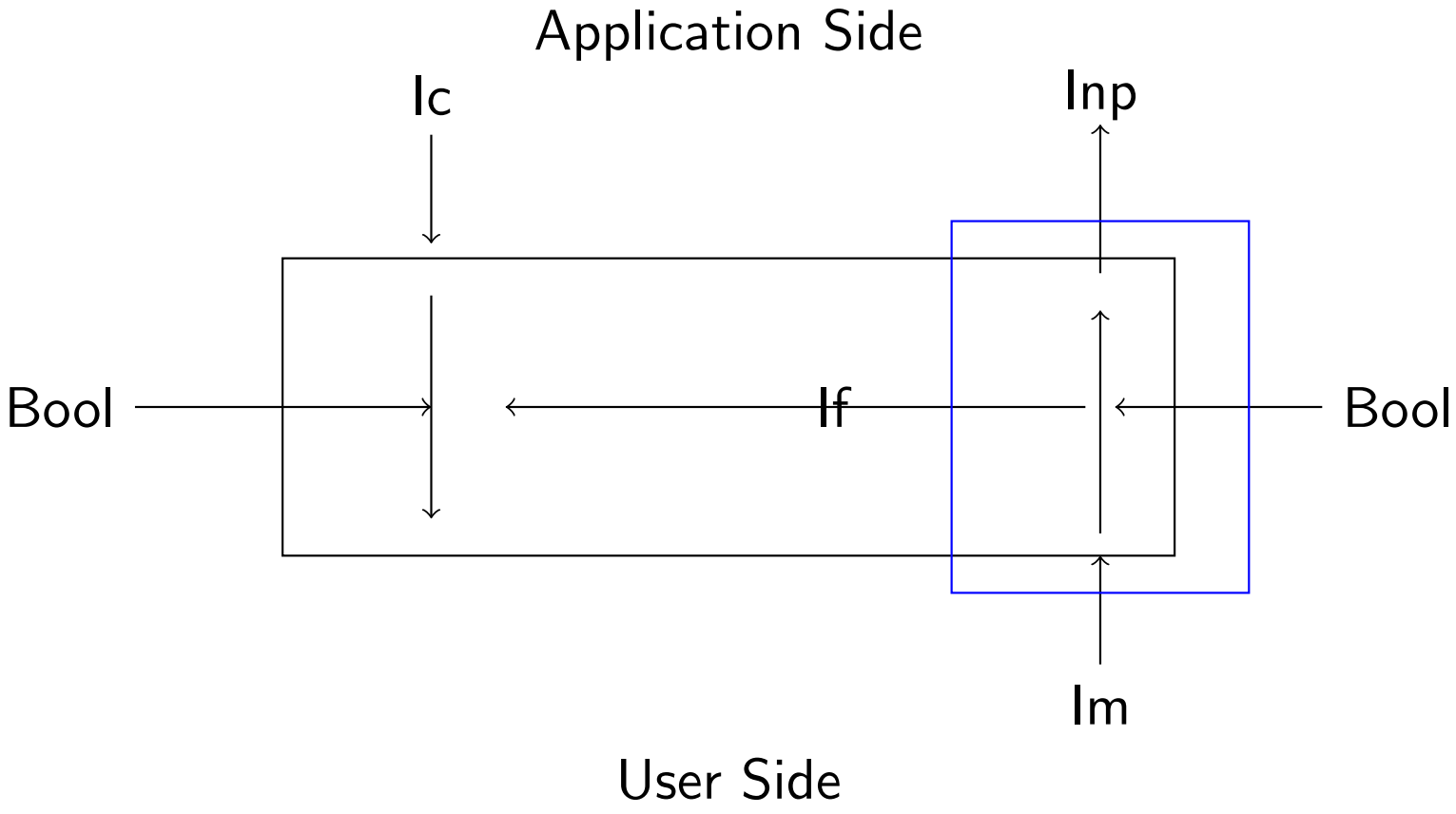

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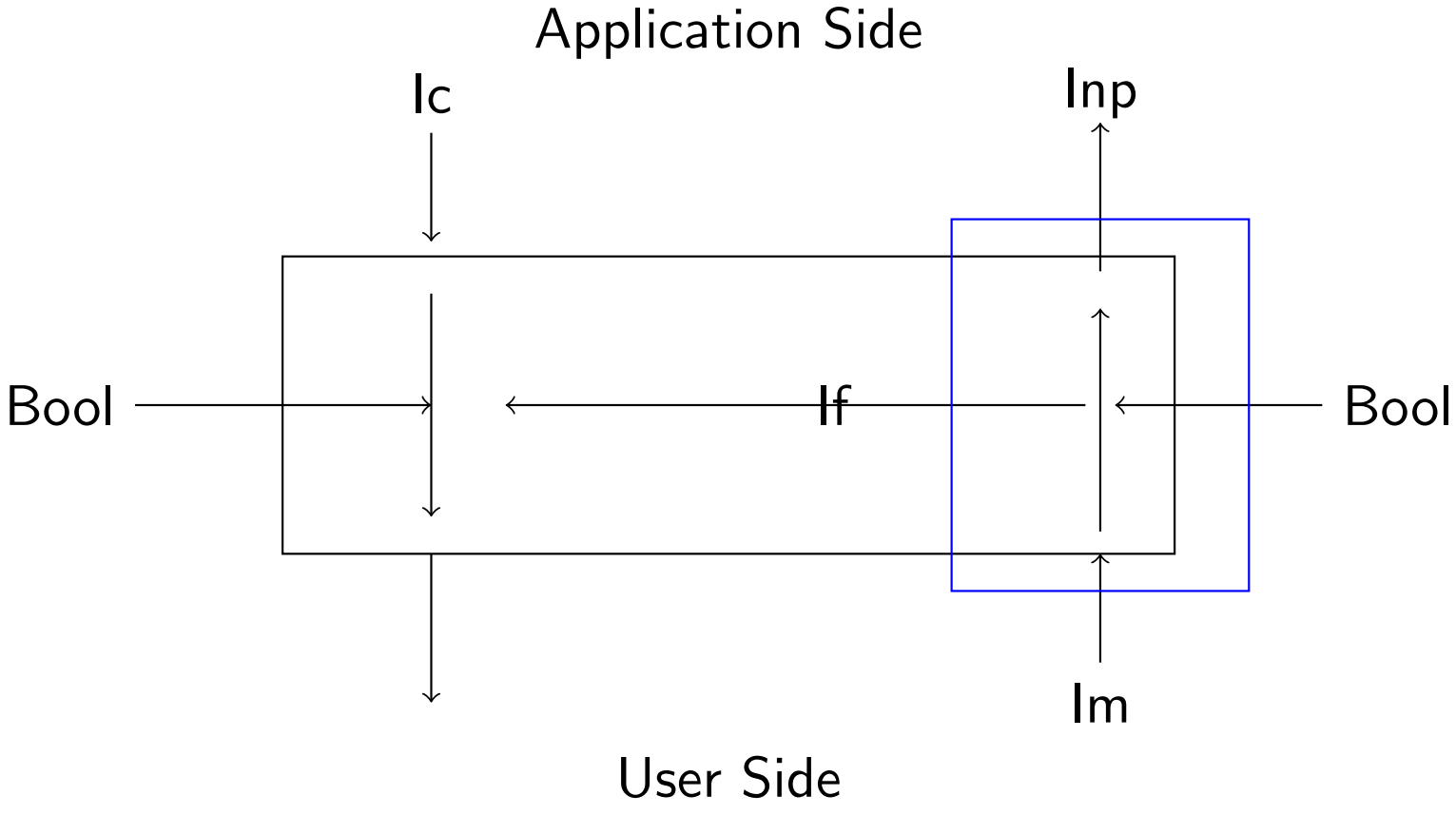

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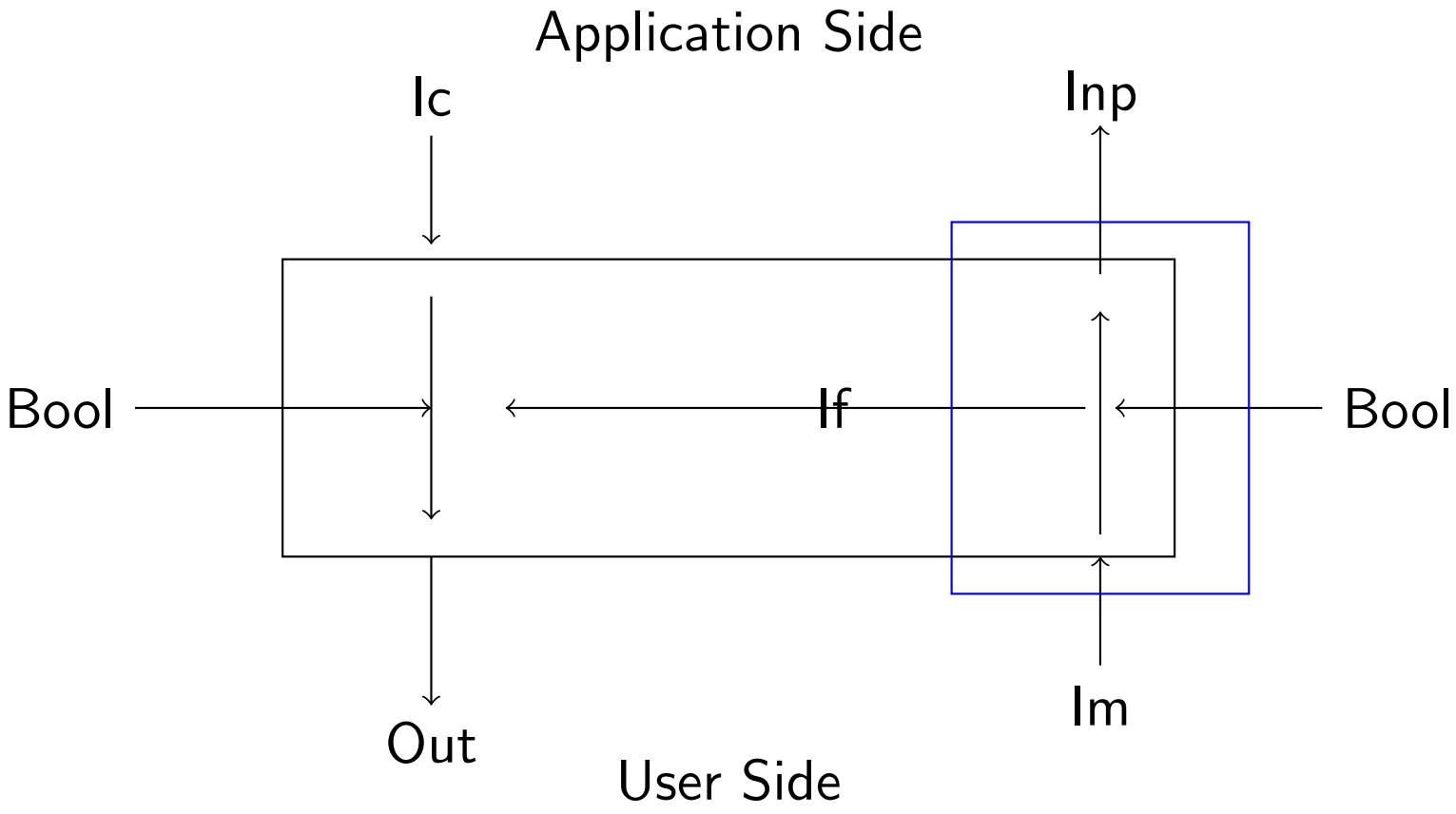

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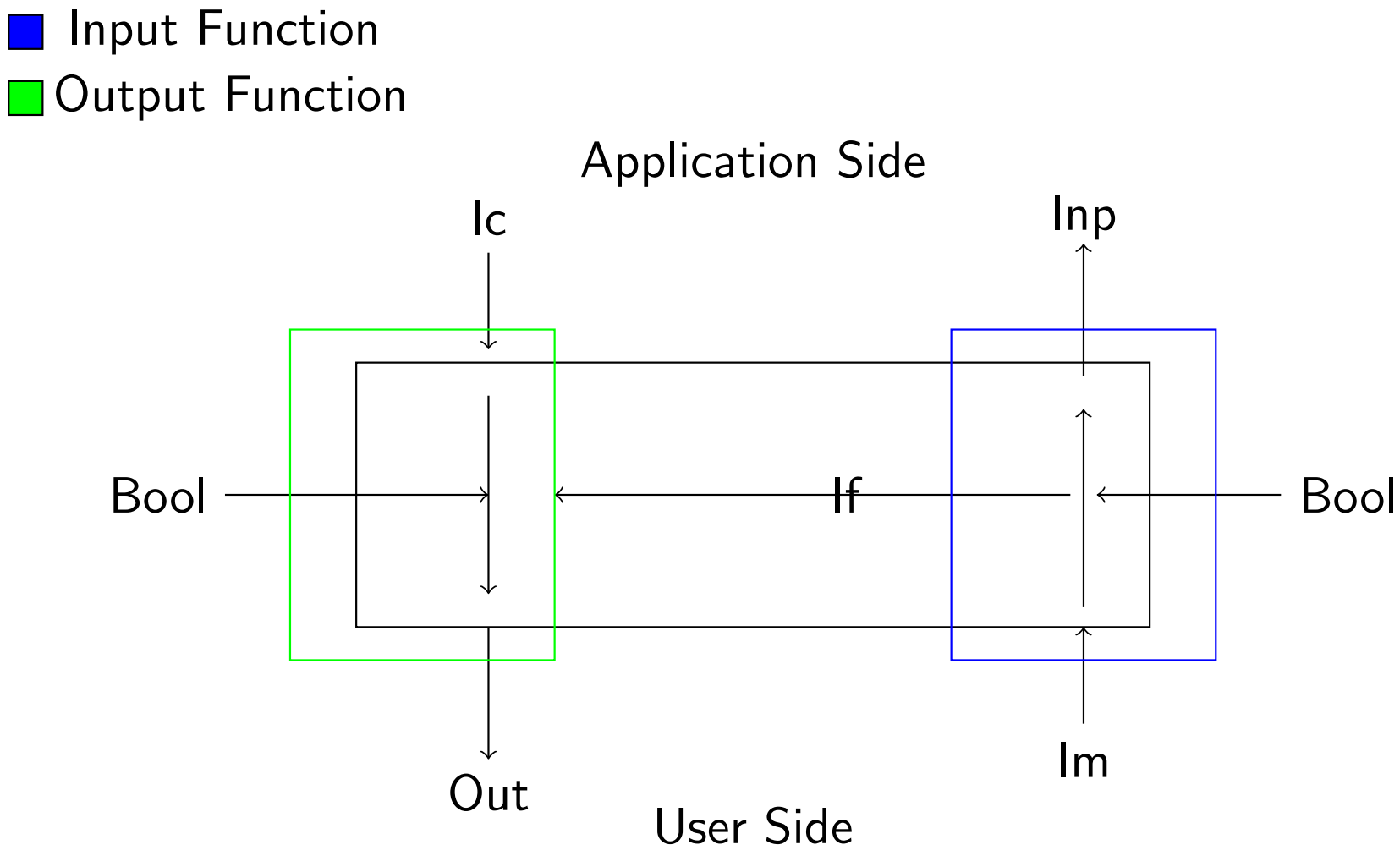
Input Function
Output Function
Application Side
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Bool
If
Bool
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Im
User Side

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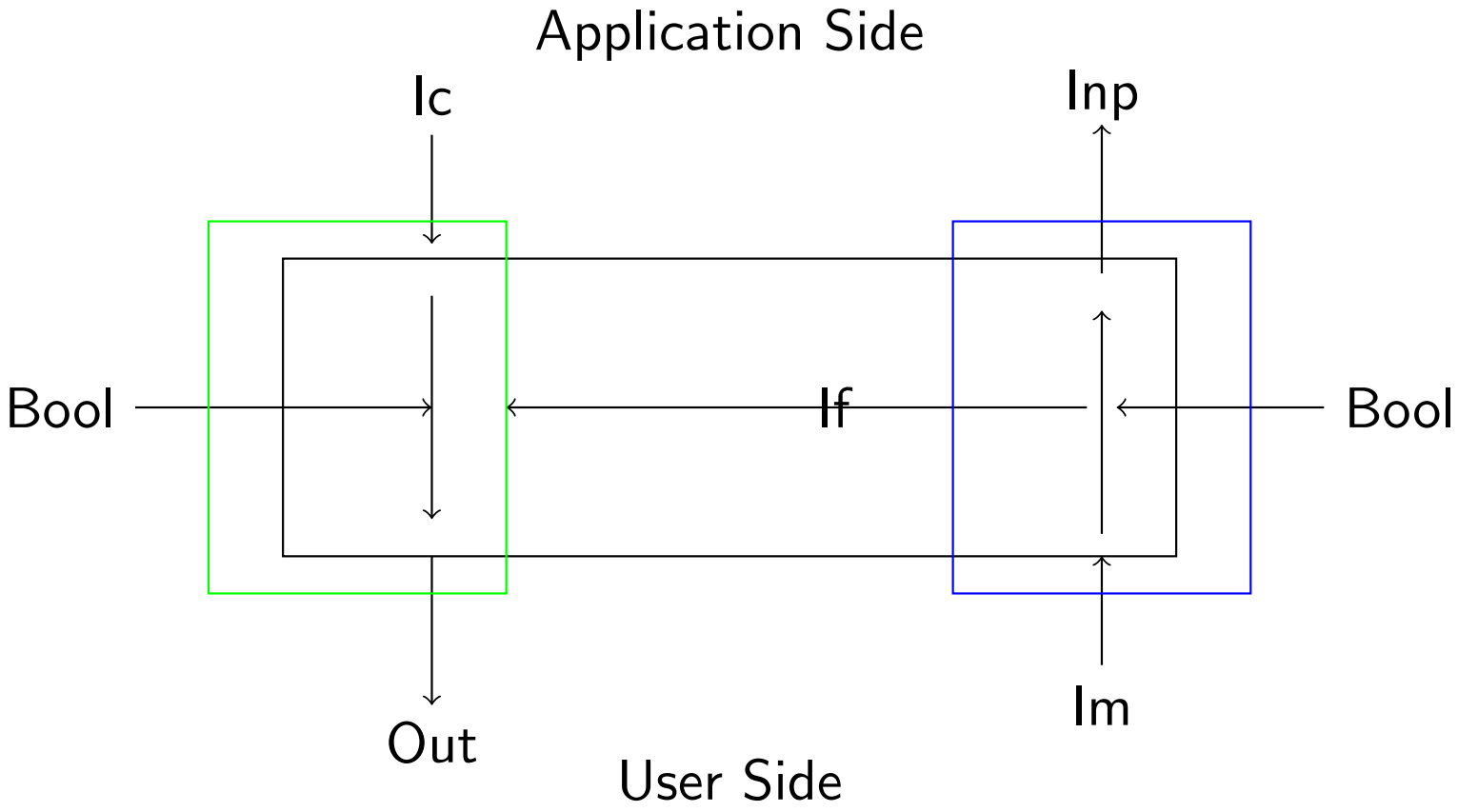
Output Function



Definition of an Interactor

Now, we can finally define an Interactor mathematically.

An Interactor is a pair of functions

$$I = (FI, FO)$$

Where,
FI = Input Function FO = Output Function

Definition of an UIS

So, We can define an UIS as,

An UIS is a composition of of Interactors

$$UIS = I1, I2, I3, ...$$