Massachusetts Institute of Technology

Architecture of Complex Systems

Week 2: Function and Emergence

Project Portfolio

Name

John Doe

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STEP 1: ABSTRACTION OF FORM

For the system you chose in Week 1, list five or more object elements or abstractions of form, to make a level 1 decompositional view. Don't feel constrained to use the same objects as you listed in Week 1.

Object elements or abstractions of form:

1 Bit Adder

- Exclusive disjunction (XOR) - gate
- Logical conjunction (AND) - gate
- Logical disjunction (OR) – gate
- External SUM bit
- Carry out bit

Please describe how and or why you used these elements / abstractions of form to construct your graphical decompositional view for the form of your system.

Personal description.

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STEP 2: SYSTEM OPERANDS AND FUNCTIONS

For your next step, you will consider value related and principal internal operands and states. With your chosen system in mind, answer the following questions:

What is the value related operand? What is/are the value related states that change? Value related process of changing those states?

Data bits;	Bit value zero (0) and one (1);	Adding.

What are the principal internal operands? What principal internal processes act on them? what are the principal internal functions?

Internal data bits (attributes are value 0 and value 1)	Exclusive disjunction (XOR), logical conjunction (AND) and logical disjunction (OR) which present the process of each logical gate	Data bits are “ANDed”; Data bits are “ORed”; Data bits are “XORed”

How do the principal internal functions connect to form the primary value pathway? How does the external function emerge from these internal functions?

The external function emerges from the sub-interrelated internal functions such as internal data bits are “ANDed”, “ORed” and “XORed”. The external “adding” process emerges from such internal processes. The internal operand, “internal data bit” is influenced by the structure of the form.

How do internal functions map to objects of form? How do the operands move between or change because of objects of form?

- Exclusive disjunction (XOR) – XOR Gate
- Logical conjunction (AND) – AND Gate
- Logical disjunction (OR) – OR Gate

The operands (data bits) are changed by structural relationships between the objects of form (logic gates)

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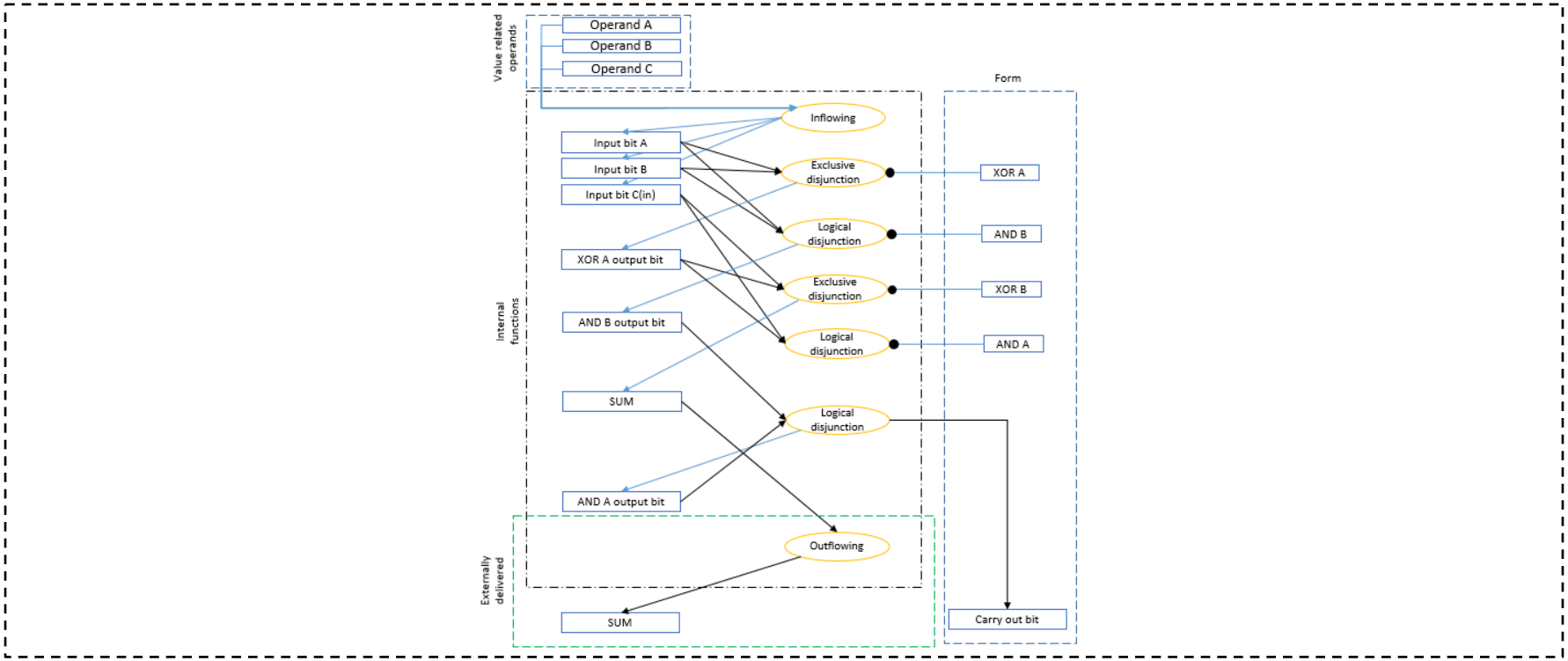
STEP 3: DEVELOP AN OPM DIAGRAM

For your system, develop an OPM diagram and insert the diagram below. Highlight or circle and label the the following: value related operand, delivered function, internal functions (operands and processes), and form. Provide a brief description of each in the field provided in the next slide.

Please remember the file size limit and resize or paste the image URL instead, as needed.

System Diagram/Schematic



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STEP 3: DEVELOP AN OPM DIAGRAM

Provide a brief description of each in the field provided of the following: value related operand, delivered function, internal functions (operands and processes), and form.

Value Related Operand:

Data bits, input data bits are processed by the internal functions and output data bits are produced.

Delivered Function:

Adding data bits and output data bits are produced.

Internal Functions (operands and processes):

Value pathway internal functions and processes described:

- Input data bits are exclusive disjunction ("XORed") by an XOR logic gate.
- Internal data bits are exclusive disjunction ("XORed") by an XOR logic gate.
- Outflowing data bit (SUM) is produced

Form:

"XOR" Gate, "AND" Gate and "OR" Gate

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STEP 4: FUNCTIONAL INFORMATION

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Give a brief description of your field and how functional information is normally conveyed. Are processes indicated? Operands? Are processes and operands combined into functions? In your description, be sure to cite at least one example:

Personal write-up based on the students experience.

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STEP 1: ABSTRACTIONS OF FORM

For the system you chose in Week 1, list five or more object elements or abstractions of form, to make a level 1 decompositional view. Don't feel constrained to use the same objects as you listed in Week 1.

Object elements or abstractions of form:

Balsa Glider

- Fuselage
- Wing
- Stabilizer
- Fin
- Counter weight
- Propeller

Please describe how and or why you used these elements / abstractions of form to construct your graphical decompositional view for the form of your system.

Personal description.

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STEP 2: SYSTEM OPERANDS AND FUNCTIONS

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What is the value related operand? What is/are the value related states that change? Value related process of changing those states?

Person;	Bored – entertained;	Entertaining.

What are the principal internal operands? What principal internal processes act on them? what are the principal internal functions?

Person/user, with attributes bored and entertained	Assembling, launching, lifting, spinning and observing.	Kit - assembling; glider - launching; glider – lifting; propeller – spinning; person – observing.

How do the principal internal functions connect to form the primary value pathway? How does the external function emerge from these internal functions?

The components income to the product system boundary. The user is an instrument to assembling the glider. The user then becomes an instrument to launching the glider. Once the glider is flying, the value related operand is observing and becomes entertained.

External function emerges through the observation of the glider in flight by the value related operand, the person or user.

How do internal functions map to objects of form? How do the operands move between or change because of objects of form?

- Kit – Assembling
- Glider – launching
- Glider – lifting
- Glider – guiding
- User – observing

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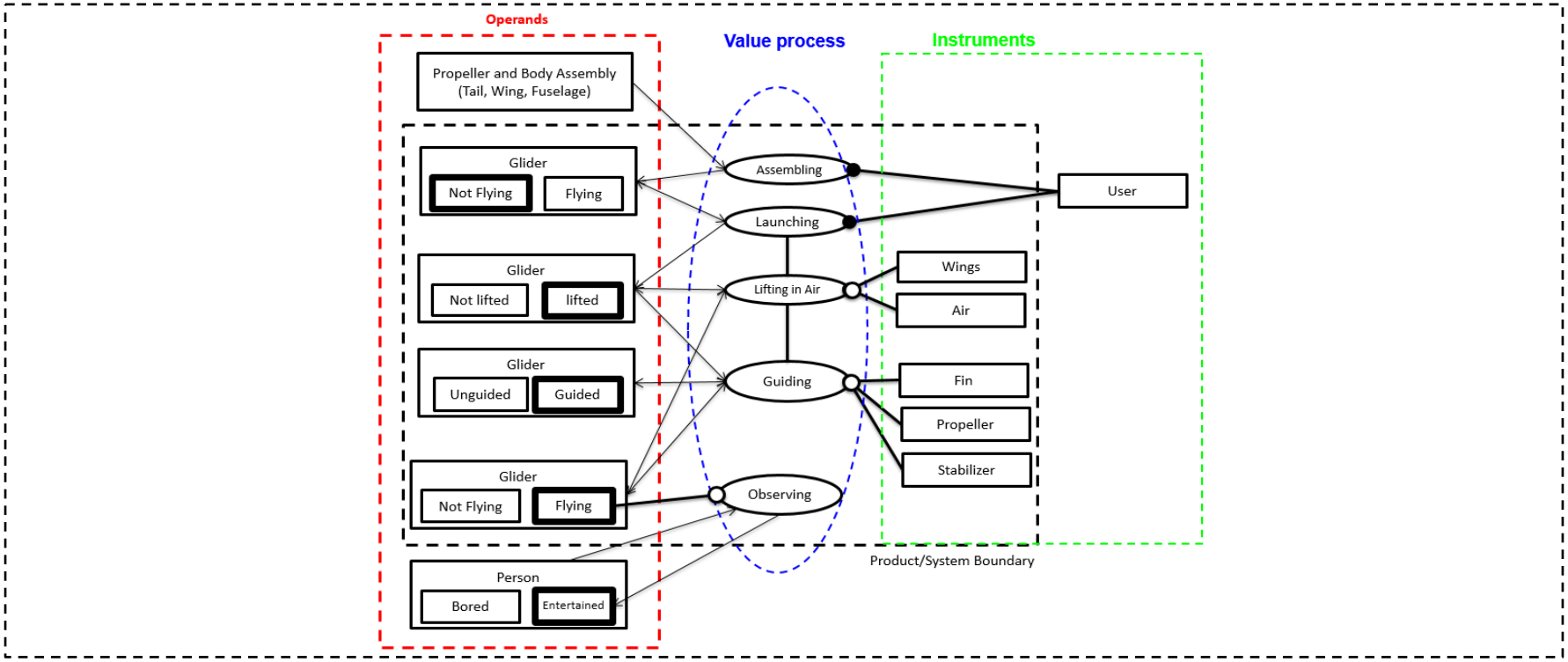

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STEP 3: DEVELOP AN OPM DIAGRAM

Provide a brief description of each in the field provided of the following: value related operand, delivered function, internal functions (operands and processes), and form.

Value Related Operand:

Person, the user is an instrument to the system. However, he's also the value related operand as he becomes entertained by observing.

Delivered Function:

Person entertaining, is the externally primary value related function.

Internal Functions (operands and processes):

- Propeller and body assembling, is the function being performed by the user.
- Launching glider is being performed by the user as an instrument to the operation.
- Glider lifting, the air is and wings allow the glider to lift.
- Glider guided, the propeller, stabilizer and fin allow the glider to have a guided flight.
- The user is observing the flying glider and becomes entertained.

Form:

Wing, fuselage, fin, stabilizer, counter weight, propeller.

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STEP 1: ABSTRACTIONS OF FORM

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Object elements or abstractions of form:

Crystal Radio

- Crystal earphone
- Diode
- Variable capacitor
- LC circuit
- Antenna
- Wire
- PBC

Please describe how and or why you used these elements / abstractions of form to construct your graphical decompositional view for the form of your system.

Personal description.

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STEP 2: SYSTEM OPERANDS AND FUNCTIONS

For your next step, you will consider value related and principal internal operands and states. With your chosen system in mind, answer the following questions:

What is the value related operand? What is/are the value related states that change? Value related process of changing those states?

Radio signal; electrical signal – audio signal; converting.

What are the principal internal operands? What principal internal processes act on them? what are the principal internal functions?

Electrical signal with attributes: current, noise, frequency. Inducing, selecting, rectifying, filtering, translating Electrical signal inducing; Frequency selecting; Current rectifying; Noise filtering; Electrical signal translating

How do the principal internal functions connect to form the primary value pathway? How does the external function emerge from these internal functions?

The antenna induces the electrical signal. LC circuit is selecting the frequency. The diode is rectifying the current. The capacitor is filtering the noise. The crystal earpiece is translating the electrical signal.

External function emerges through the conversion of the radio signal through different functions into an audio signal.

How do internal functions map to objects of form? How do the operands move between or change because of objects of form?

- Inducing – Antenna;
- Selecting – LC Circuit
- Rectifying – Diode
- Filtering – Capacitor
- Translating – Crystal earpiece

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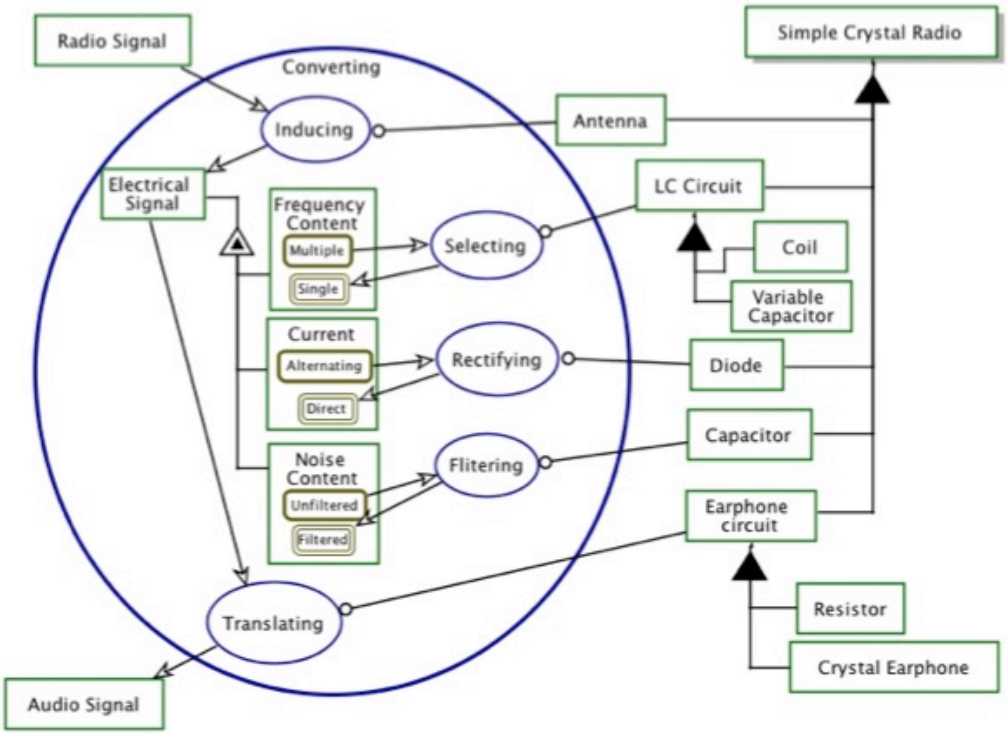

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STEP 3: DEVELOP AN OPM DIAGRAM

Provide a brief description of each in the field provided of the following: value related operand, delivered function, internal functions (operands and processes), and form.

Value Related Operand:

Signal, the radio signal (operand) is what is being transformed by the internal functions.

Delivered Function:

Signal converting, is the externally primary value related function.

Internal Functions (operands and processes):

- Electric signal inducing, is the function being performed by the antenna.
- Frequency selecting, the LC circuit is selecting the appropriate frequency.
- Current rectifying, the diode then rectifies it.
- Noise filtering, the capacitor smooths the signal or removes the noise.
- Electrical signal translating, the output is then translated to audio by the crystal earpiece.

Form:

Antenna, LC Circuit, Diode, Capacitor, crystal earpiece.

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Object elements or abstractions of form:

Prime Number

- Temporary memory
- Memory registers
- Code

Please describe how and or why you used these elements / abstractions of form to construct your graphical decompositional view for the form of your system.

Personal description.

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What is the value related operand? What is/are the value related states that change? Value related process of changing those states?

Number(s); Unknown prime numbers – only prime numbers; searching.

What are the principal internal operands? What principal internal processes act on them? what are the principal internal functions?

Internal number (n) with attributes prime and not prime. Importing, calculating, looping, testing, appending, printing. Importing external number; calculating number range; testing number; appending number; printing prime array

How do the principal internal functions connect to form the primary value pathway? How does the external function emerge from these internal functions?

External function emerges through search for prime numbers through different functions into a prime-only array that is printed to console.

How do internal functions map to objects of form? How do the operands move between or change because of objects of form?

- Importing var to temp memory
- Calculating range to search to temp memory
- Looping range (n) in memory with for loop code
- Testing var (i) if prime with prime test code function
- Appending prime numbers to prime array
- Printing prime array

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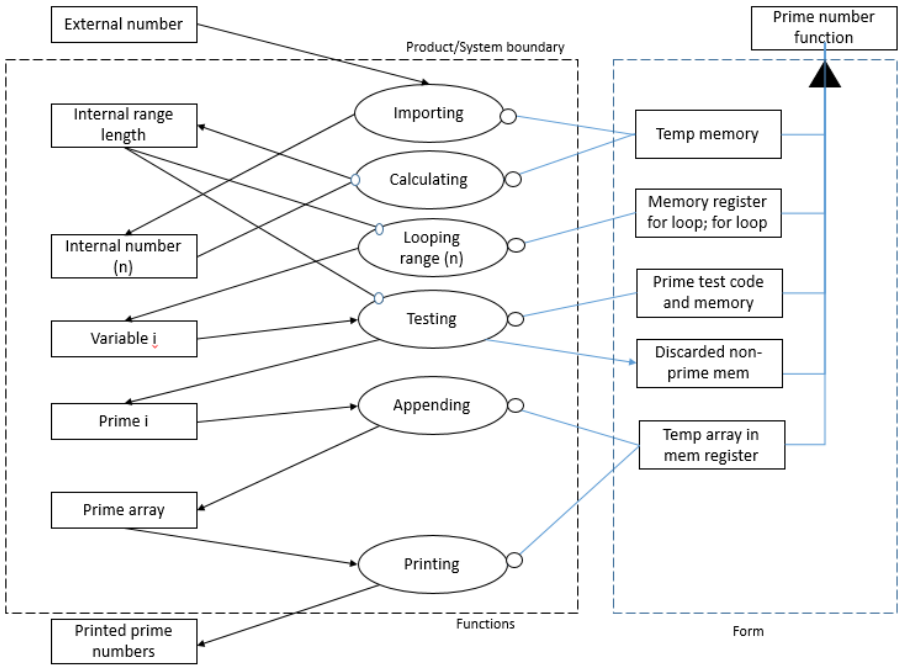

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STEP 3: DEVELOP AN OPM DIAGRAM

Provide a brief description of each in the field provided of the following: value related operand, delivered function, internal functions (operands and processes), and form.

Value Related Operand:

Number (range), the number (operand) is what is being transformed by the internal functions.

Delivered Function:

Prime array printing, is the externally primary value related function.

Internal Functions (operands and processes):

- External number importing
- Calculating internal range length
- Looping range length
- Testing variable (i)
- Appending prime (i)
- Printing prime array

Form:

Temporary memory, Memory registers, Code

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Object elements or abstractions of form:

Telescope

- Objective lens
- Eyepiece lens
- Eyepiece
- Focal tube
- Focus knob
- Legs
- Focal tube mount
- Tripod flange

Please describe how and or why you used these elements / abstractions of form to construct your graphical decompositional view for the form of your system.

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What is the value related operand? What is/are the value related states that change? Value related process of changing those states?

Light;	Diluted light – concentrated light;	Concentrating

What are the principal internal operands? What principal internal processes act on them? what are the principal internal functions?

light and converged light;	converging and focusing;	(1) “converging light” and (2) “focusing converged light”.

How do the principal internal functions connect to form the primary value pathway? How does the external function emerge from these internal functions?

As the light enters the system and then passes through the first lens where it is converged and then as it passes through the second lens it is focused, so that the end result of the system is that light is concentrated.

External function is concentrating light. The primary purpose or, what the system was built for.

How do internal functions map to objects of form? How do the operands move between or change because of objects of form?

- Converging light maps to the objective lens.
- Focusing light maps to the eyepiece lens
- Supporting lenses maps to the focal tube

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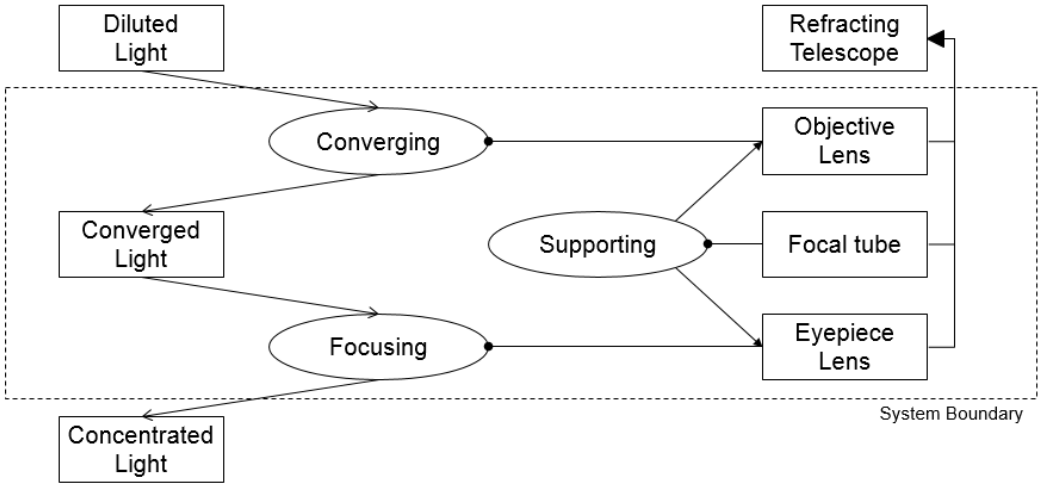

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STEP 3: DEVELOP AN OPM DIAGRAM

Provide a brief description of each in the field provided of the following: value related operand, delivered function, internal functions (operands and processes), and form.

Value Related Operand:

"Light" is the operand as it is modified by the telescope

Delivered Function:

The externally delivered primary value related function is "concentrating light", as the Function = Process + Operand and as that is the main value of a telescope.

Internal Functions (operands and processes):

- Objective lens is converging the light towards a concentrated single point.
- Eyepiece lens focuses the converged light.
- The tube is supporting the objective lens and eyepiece lens at a set distance and position.

Provides structural relationships.

Form:

Objective lens, eyepiece lens and tube.

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