Objectives

- The objectives of this session are the following:
  - The students have a general idea of the object-oriented core concepts in the form of object, attribute, method, and class.
  - The students are able to describe the general idea of encapsulation principle.
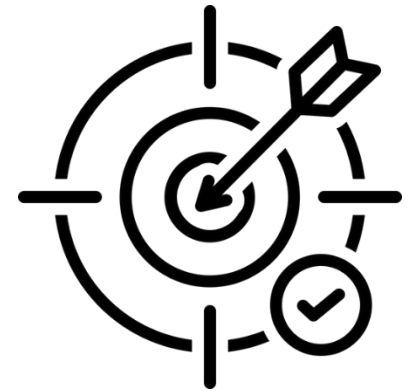
Outlines

1. Programming paradigm
2. What is object-oriented?
3. What is an object?
4. Encapsulation principle
5. What is a class?

Programming Paradigm

Programming paradigm

- A paradigm dictates our way to
  - see and understand a problem;
  - design and construct a solution.

- Procedural programming is a very common one.
  - It focus on the business process, the detailed steps.
  - The same data are used in multiple functions and procedures.

What is Object-oriented?

What is object-oriented?

- It is a mental model that encourage us to see a system as a group of interacting objects.
  - An object has a specific responsibility.

- Compared to the procedural, OO:
  - Focus on the object responsibility.
  - **Data + operations** are encapsulated (wrapped) together.
  - Start small, grow, and change as needed (more complex).
  - Much more reusable.

What is an Object?

What is an object?

- **Everything** is object (physical or imaginary).
  - The existence of an object is independent from the others.
  - Every object is unique and must be identifiable.

- An object consists of two things:
  - **a set of attributes** with values, together representing the object state.
  - **a set of behaviors**, or what it can do.
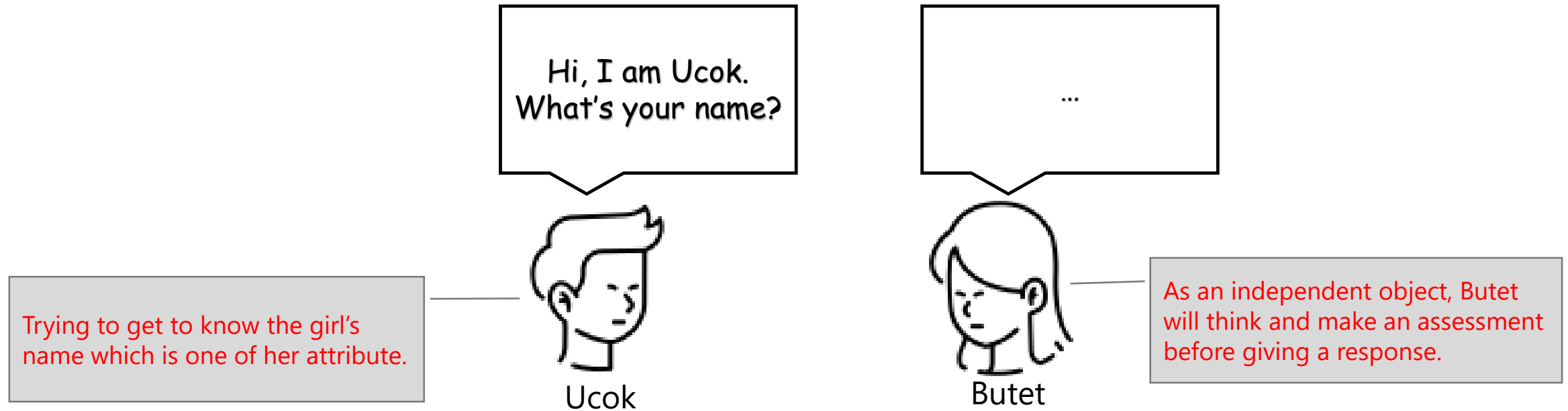
Encapsulation Principle

Core principles

- Encapsulation.
  - Wrapping attributes and their related behaviors into a cohesive object.

- Inheritance.
  - An ability to reuse, modify, or add new attributes or behaviors into an existing class.

- Polymorphism.
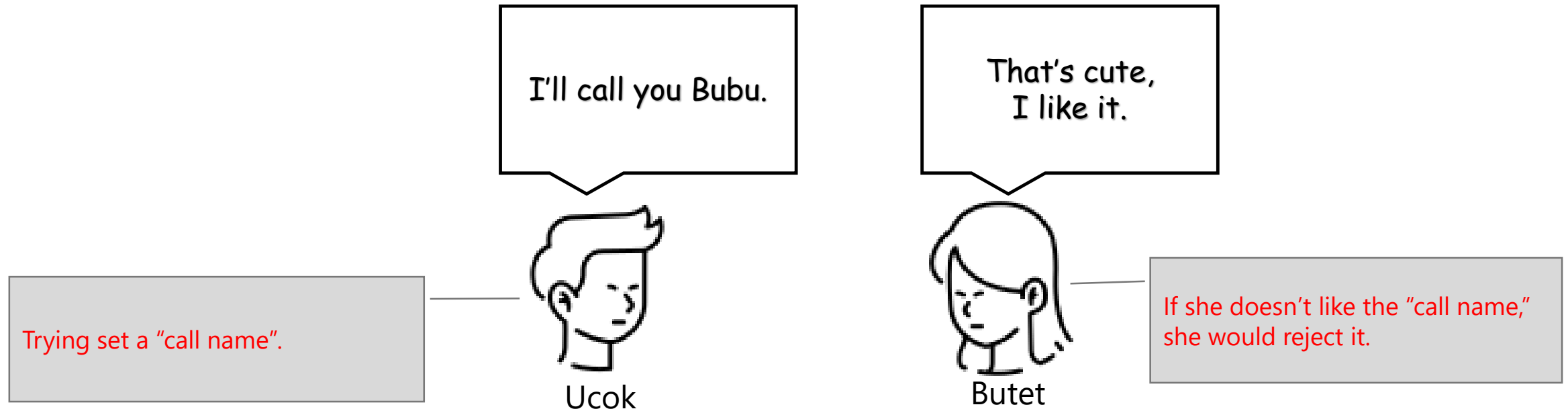 - An ability to share similar behaviors and characteristics.

Encapsulation principle

- An object is fully responsible to keep its state from the external world, **encapsulation**.

- For an external entity, an attribute of an object can only be:
  - accessed via the object's **accessor** methods; or
  - modified via the object's **mutator** methods.

Encapsulation principle

Hi, I am Ucok. What's your name?

...

Trying to get to know the girl's name which is one of her attribute.

As an independent object, Butet will think and make an assessment before giving a response.

Ucok

Butet

Encapsulation principle

Object's attributes

- Attributes are characteristics that describe the state of an object.
  - An attribute can only be changed by the **object itself**.

- Different objects having the same attribute values are called equal objects.
  - Like the twins?
  - Cars from the same model?

- Equal objects != the same object.

Object's attributes

- What are the attributes of these things?

- Volume: ... mL
- Material: ...
- Color: ...
- Shape: ...
- Height: ...
- Content: ...
- etc.

Object's behaviors

- Behaviors are actions or operations that an object can perform.
  - mechanism to interact with other objects.

- Performing a behavior may impact the object's state.
  - An attribute value should only be changed via a behavior.

- Technically, behavior is also called method.
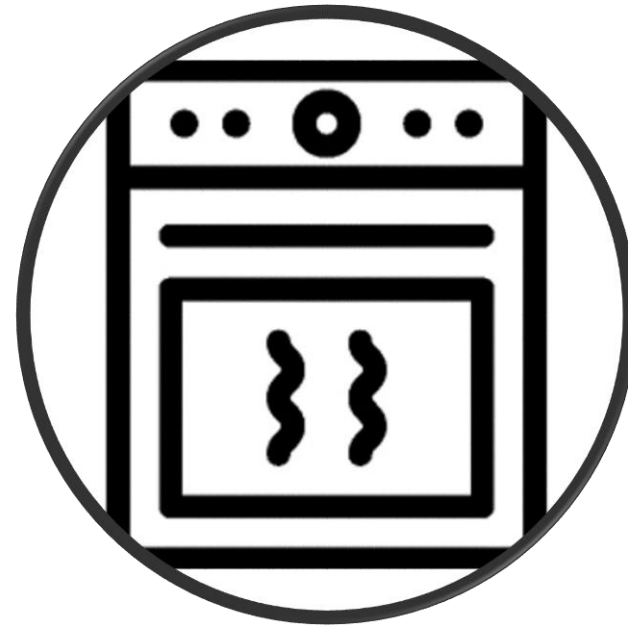
What can these things do?

a blender   a mixer   an oven
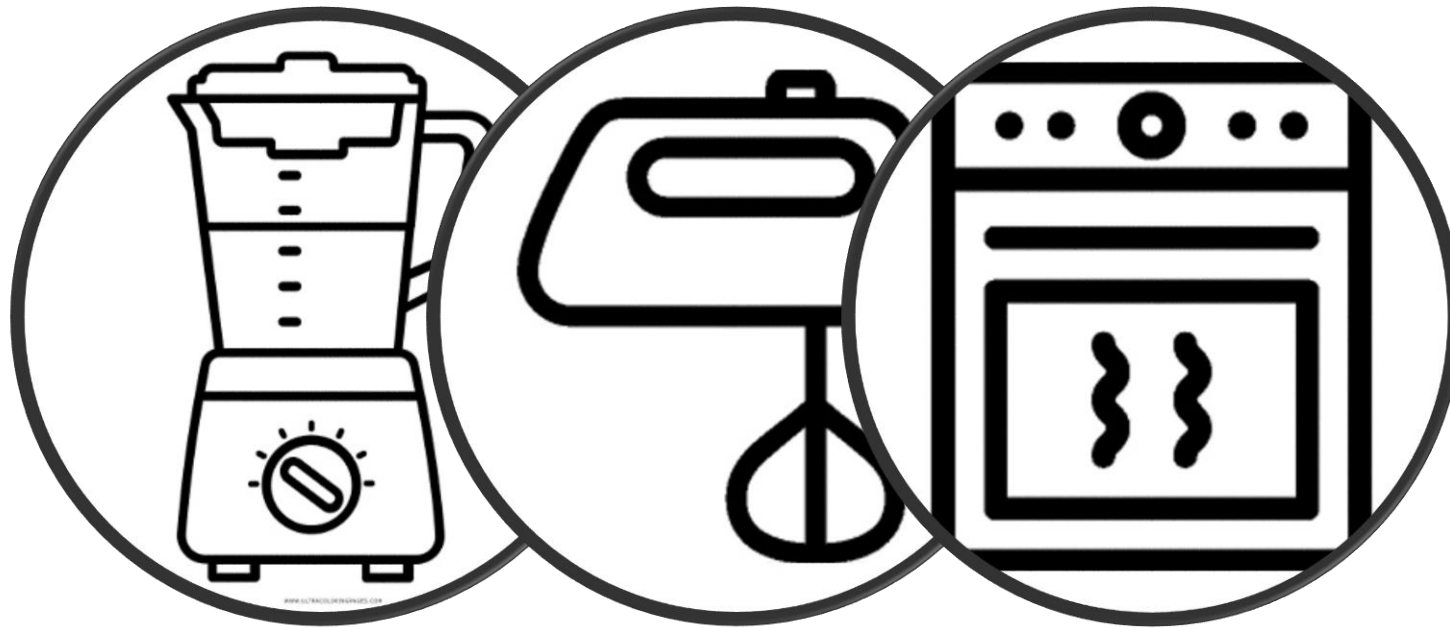
What can these things do?

an oven

- heat up
- set count down timer
- turned on/off
- open the chamber

What can these things do?

a blender

- spin up
- pour out
- add more things
- turned on/off
- open the chamber

What can these things do?

a mixer

What is a Class?

What is a class?

- A group of objects with the same set of attributes comes from the same blueprint (Class).

- A **class** is a blueprint that is used as a template to create or instantiate objects.
  - It defines what attributes an object would have.
  - It express what actions the object could do.

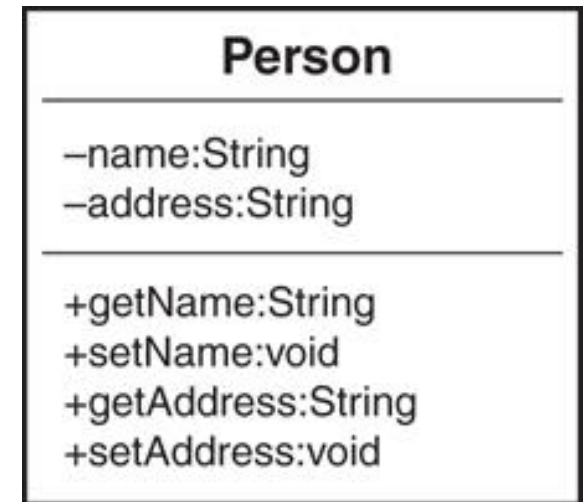- UML Class diagram is used to model class structure.

Person

−name:String
−address:String

+getName:String
+setName:void
+getAddress:String
+setAddress:void

Image source: Matt Weisfeld. The Object-Oriented Thought Process.

Important Terms

Important terms

- Class → object blueprint or specs or definition.
- Object → an instance or a physical representation of of a Class.
- Attribute → a property or a field.
- Behavior → a method or an operation.
- Encapsulation → binding attributes and the related behaviors into a unit that fully responsible to protect its own data.

References

- Cay Horstman. Core Java.
- Matt Weisfeld. The Object-Oriented Thought Process.

Thank you