كليـــة العلـــــوم
قسم الأمن السيبراني

**Subject: Object Oriented Programming (OOP)**

**Second Stage**

**Lecturer: Dr. Abdulkadhem A. Abdulkadhem**

**Lecture (5)**

 **Introduction to Object-Oriented Programming (OOP) -Continue**

**2.4. Polymorphism:**

Polymorphism allows objects of different types to be treated as objects of a common superclass. It enables a single function or method to behave differently based on the object that calls it.

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| خلفيات 4K الحرباء جديدة , اجمل صور الزواحف , 2024 Chameleon Wallpapers |  صقور الإبدآع#include <iostream>using namespace std;class Animal {public:  virtual void makeSound() { cout << "Some generic animal sound" << endl; }};class Dog : public Animal {public: void makeSound() override { cout << "Woof!" << endl; }};class Cat : public Animal {public: void makeSound() override { cout << "Meow!" << endl; }};int main() { Animal\* myAnimal; Dog myDog; Cat myCat; myAnimal = &myDog; myAnimal->makeSound(); // Outputs: Woof! myAnimal = &myCat; myAnimal->makeSound(); // Outputs: Meow! return 0;} |

**Explanation:**

* Here, we use polymorphism to treat Dog and Cat objects as Animal objects. The method makeSound() behaves differently depending on whether it's called by a Dog or a Cat.
* Polymorphism enables flexibility and the ability to handle multiple object types through a common interface (in this case, Animal).

**Example**: Let’s consider a simple example where we have different geometric shapes like circles, rectangles, and triangles. We want to write a method that can draw any shape, but the way we draw each shape is different.

To achieve this, we can create a base class Shape that has a virtual method draw(). Each derived class will override the draw() method to provide its specific implementation.

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| #include <iostream>using namespace std;class Shape { // Base class (superclass)public: virtual void draw() { // Virtual function to allow overriding in derived classes cout << "Drawing a generic shape" << endl; }};class Circle : public Shape { // Derived class representing a circlepublic: void draw() override { // Overriding the draw() function for Circle cout << "Drawing a circle" << endl; }};class Rectangle : public Shape { // Derived class representing a rectanglepublic: void draw() override { // Overriding the draw() function for Rectangle cout << "Drawing a rectangle" << endl; }};class Triangle : public Shape { // Derived class representing a trianglepublic: void draw() override { // Overriding the draw() function for Triangle cout << "Drawing a triangle" << endl; }};int main() { Shape\* shape; // Pointer to base class (Shape) Circle circle; Rectangle rectangle; Triangle triangle; shape = &circle; // Assign pointer to Circle object and call draw() shape->draw(); // Output: Drawing a circle shape = &rectangle; // Assign pointer to Rectangle object and call draw() shape->draw(); // Output: Drawing a rectangle shape = &triangle; // Assign pointer to Triangle object and call draw() shape->draw(); // Output: Drawing a triangle return 0;} |

**3. Conclusion:**

Object-Oriented Programming makes software design more organized and intuitive by breaking down a problem into objects. Through abstraction, encapsulation, inheritance, and polymorphism, OOP encourages code reuse, modularity, and ease of maintenance.
Key Takeaways:

* **Abstraction** simplifies complex systems.
* **Encapsulation** protects data and ensures controlled access.
* **Inheritance** promotes code reuse.
* **Polymorphism** allows for flexibility in method behavior.