

CMSC 132: Object-Oriented Programming II

Java I/O Overview

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Input/Output

■ Approaches to store file data

■ Text files

- Data represented in human-readable form
- Example: Java source programs
- Use text editor to manipulate the data

■ Binary files

- Data represented in binary form
- Designed to be read by programs
- More compact
- More efficient to process (no encoding/decoding required)

■ Keep in mind all files are stored in binary format

■ Text I/O provides a level of abstraction to encode/decode characters

Input/Output

- **Several Java I/O classes**
- **Relying on java.io.***
- **I/O classes can be categorized in input/output classes and whether they deal with text or binary data**
- **Input Object (Input Stream)**
 - **Object reads a stream of data from a file**
- **Output Object (Output Stream)**
 - **Object writes a stream of data to a file**

Input/Output

- **InputStream class** – abstract superclass of all classes representing an input stream of bytes
- **OutputStream class** – abstract superclass of all classes representing an output stream of bytes
- **File class**
 - Encapsulates the properties of a file or directory
 - Does not provide methods to read/write from/to a file
 - Example: `File f = new File("data.txt");`
 - Methods
 - `exists()` → tests whether file/directory exists
 - `delete()` → deletes file/directory
 - others

Text Files Input Classes

■ **FileReader**

- read method – returns a character or -1 (end of stream)
- close method – closes the stream and releases any system resources
- Example: FileReaderEx.java

■ **BufferedReader**

- Reads text from character-input stream, buffering characters for efficiency
- readLine method – reads a line of text
- Example: BufferedReaderEx.java

■ **Scanner**

- Breaks input into tokens delimited by whitespace
- Methods: hasNext(), nextInt(), nextDouble(), next(), Others
- Example: ScannerEx.java

Text Files Output Classes

■ **FileWriter**

- **write(int c) method** – writes a single character
- **close method** – closes the stream and releases any system resources
- **Example: FileWriterEx.java**

■ **BufferedWriter**

- **Writes text to a character-output stream, buffering characters for efficiency**
- **Example: BufferedWriterEx.java**

■ **PrintWriter**

- **print method**
- **println method**
- **printf method**
- **Example: PrintWriterEx.java, FileReadWriteEx.java**

Binary Files Input/Output Classes Overview

■ Output

- **FileOutputStream** – for writing bytes to a file
- **BufferedOutputStream** – adds a buffer
- **DataOutputStream** – converts primitive type values or strings into bytes and outputs them to the stream
- Example: `BinaryFileWriterEx.java`

■ Input

- **FileInputStream** – for reading bytes from a file
- **BufferedInputStream** – adds a buffer
- **DataInputStream** – reads data from a stream and converts data into appropriate primitive type or strings
- Example: `BinaryFileReaderEx.java`

Standard Input/Output

■ Standard I/O

- Provided in System class in java.lang

- System.in

 - An instance of InputStream

- System.out

 - An instance of PrintStream

- System.err

 - An instance of PrintStream

■ We can use the Scanner class with System.in