

# Demonstrate the ICharQ interface: A character queue interface

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/*
C# A Beginner's Guide
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/*
Project 9-1

Demonstrate the ICharQ interface.
*/
using System;

// A character queue interface.
public interface ICharQ {
    // Put a character into the queue.
    void put(char ch);

    // Get a character from the queue.
    char get();
}

// A fixed-size queue class for characters.
class FixedQueue : ICharQ {
    char[] q; // this array holds the queue
    int putloc, getloc; // the put and get indices

    // Construct an empty queue given its size.
    public FixedQueue(int size) {
        q = new char[size+1]; // allocate memory for queue
        putloc = getloc = 0;
    }
}
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}

// Put a character into the queue.
public void put(char ch) {
if(putloc==q.Length-1) {
Console.WriteLine(" – Queue is full.");
return;
}

putloc++;
q[putloc] = ch;
}

// Get a character from the queue.
public char get() {
if(getloc == putloc) {
Console.WriteLine(" – Queue is empty.");
return (char) 0;
}

getloc++;
return q[getloc];
}

// A circular queue.
class CircularQueue : ICharQ {
char[] q; // this array holds the queue
int putloc, getloc; // the put and get indices

// Construct an empty queue given its size.
public CircularQueue(int size) {
q = new char[size+1]; // allocate memory for queue
putloc = getloc = 0;
}

// Put a character into the queue.
public void put(char ch) {
/* Queue is full if either putloc is one less than
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getloc, or if putloc is at the end of the array  
and getloc is at the beginning. */  
if(putloc+1==getloc |  
((putloc==q.Length-1) & (getloc==0))) {  
Console.WriteLine(" – Queue is full.");  
return;  
}  
  
putloc++;  
if(putloc==q.Length) putloc = 0; // loop back  
q[putloc] = ch;  
}  
  
// Get a character from the queue.  
public char get() {  
if(getloc == putloc) {  
Console.WriteLine(" – Queue is empty.");  
return (char) 0;  
}  
  
getloc++;  
if(getloc==q.Length) getloc = 0; // loop back  
return q[getloc];  
}  
}  
  
// A dynamic queue.  
class DynQueue : ICharQ {  
char[] q; // this array holds the queue  
int putloc, getloc; // the put and get indices  
  
// Construct an empty queue given its size.  
public DynQueue(int size) {  
q = new char[size+1]; // allocate memory for queue  
putloc = getloc = 0;  
}  
  
// Put a character into the queue.  
public void put(char ch) {
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if(putloc==q.Length-1) {
// increase queue size
char[] t = new char[q.Length * 2];

// copy elements into new queue
for(int i=0; i < q.Length; i++) t[i] = q[i]; q = t; }
putloc++; q[putloc] = ch; } // Get a character from the queue.
public char get() { if(getloc == putloc) { Console.WriteLine(
"-- Queue is empty."); return (char) 0; } getloc++; return
q[getloc]; } } // Demonstrate the queues. public class IQDemo
{ public static void Main() { FixedQueue q1 = new
FixedQueue(10); DynQueue q2 = new DynQueue(5); CircularQueue
q3 = new CircularQueue(10); ICharQ iQ; char ch; int i; iQ =
q1; // Put some characters into fixed queue. for(i=0; i < 10;
i++) iQ.put((char) ('A' + i)); // Show the queue.
Console.Write("Contents of fixed queue: "); for(i=0; i < 10;
i++) { ch = iQ.get(); Console.Write(ch); }
Console.WriteLine(); iQ = q2; // Put some characters into
dynamic queue. for(i=0; i < 10; i++) iQ.put((char) ('Z' - i));
// Show the queue. Console.Write("Contents of dynamic queue:
"); for(i=0; i < 10; i++) { ch = iQ.get(); Console.Write(ch);
}
Console.WriteLine(); iQ = q3; // Put some characters into
circular queue. for(i=0; i < 10; i++) iQ.put((char) ('A' +
i)); // Show the queue. Console.Write("Contents of circular
queue: "); for(i=0; i < 10; i++) { ch = iQ.get();
Console.Write(ch); }
Console.WriteLine(); // Put more characters into circular queue.
for(i=10; i < 20; i++) iQ.put((char) ('A' + i)); // Show the
queue. Console.Write("Contents of circular queue: "); for(i=0;
i < 10; i++) { ch = iQ.get(); Console.Write(ch); }
Console.WriteLine(" Store and consume from" + " circular
queue."); // Use and consume from circular queue. for(i=0; i <
20; i++) { iQ.put((char) ('A' + i)); ch = iQ.get();
Console.Write(ch); } } } [/csharp]
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