Step-by-step walkthrough for example on page 42 of the lecture notes: Object Initialization, Construction and Destruction

```cpp
#include <cstring> /* File: default-assign-bug.cpp */
class Word
{
  private:
    int frequency; char* str;
  public:
    Word() : frequency(0), str(nullptr) { }
    Word(const char* s, int k = 0): frequency(k)
        { str = new char [strlen(s)+1]; strcpy(str, s); }
    ~Word() { delete [] str; }
};

void Bug(Word& x) { Word bug("bug", 4); x = bug; }

int main() { Word movie("Titanic"); Bug(movie); return 0; }
```
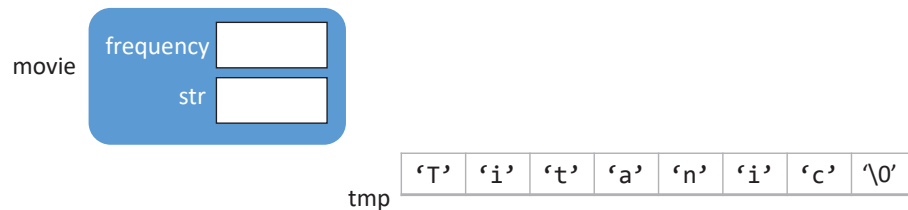
```cpp
#include <cstring> /* File: default-assign-bug.cpp */
class Word
{
  private:
    int frequency; char* str;
  public:
    Word() : frequency(0), str(nullptr) { }
    Word(const char* s, int k = 0): frequency(k)
        { str = new char [strlen(s)+1]; strcpy(str, s); }
    ~Word() { delete [] str; }
};

void Bug(Word& x) { Word bug("bug", 4); x = bug; }

int main() { Word movie("Titanic"); Bug(movie); return 0; }
```

movie — frequency [ ] str [ ]

tmp: | 'T' | 'i' | 't' | 'a' | 'n' | 'i' | 'c' | '\0' |

```cpp
#include <cstring> /* File: default-assign-bug.cpp */
class Word
{
  private:
    int frequency; char* str;
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    Word() : frequency(0), str(nullptr) { }
    Word(const char* s, int k = 0): frequency(k)
        { str = new char [strlen(s)+1]; strcpy(str, s); }
    ~Word() { delete [] str; }
};

void Bug(Word& x) { Word bug("bug", 4); x = bug; }

int main() { Word movie("Titanic"); Bug(movie); return 0; }
```
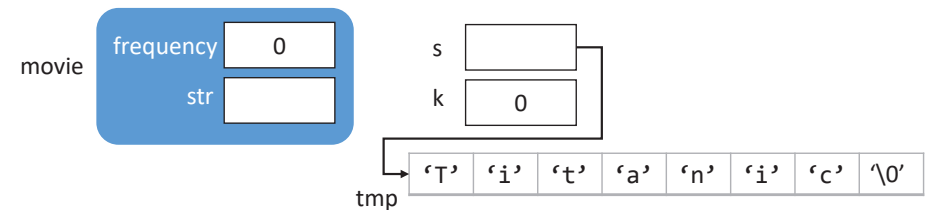
movie — frequency [0] str [ ]

s [ ]   k [0]

tmp: | 'T' | 'i' | 't' | 'a' | 'n' | 'i' | 'c' | '\0' |

Top-left:

```cpp
#include <cstring> /* File: default-assign-bug.cpp */
class Word
{
  private:
    int frequency; char* str;
  public:
    Word() : frequency(0), str(nullptr) { }
    Word(const char* s, int k = 0): frequency(k)
        { str = new char [strlen(s)+1]; strcpy(str, s); }
    ~Word() { delete [] str; }
};

void Bug(Word& x) { Word bug("bug", 4); x = bug; }

int main() { Word movie("Titanic"); Bug(movie); return 0; }
```
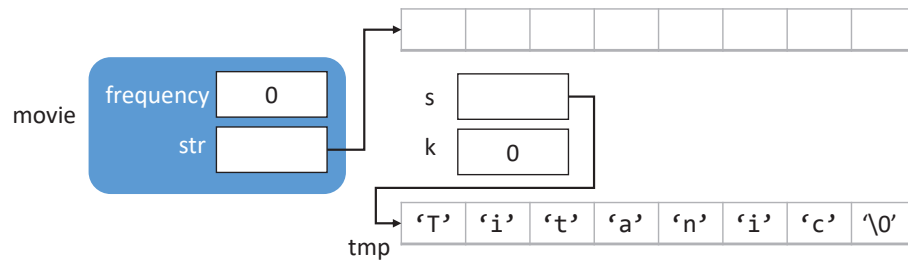
movie: frequency `0`, str →

s → | 'T' | 'i' | 't' | 'a' | 'n' | 'i' | 'c' | '\0' | (tmp)

k `0`

Top-right:

```cpp
#include <cstring> /* File: default-assign-bug.cpp */
class Word
{
  private:
    int frequency; char* str;
  public:
    Word() : frequency(0), str(nullptr) { }
    Word(const char* s, int k = 0): frequency(k)
        { str = new char [strlen(s)+1]; strcpy(str, s); }
    ~Word() { delete [] str; }
};

void Bug(Word& x) { Word bug("bug", 4); x = bug; }

int main() { Word movie("Titanic"); Bug(movie); return 0; }
```
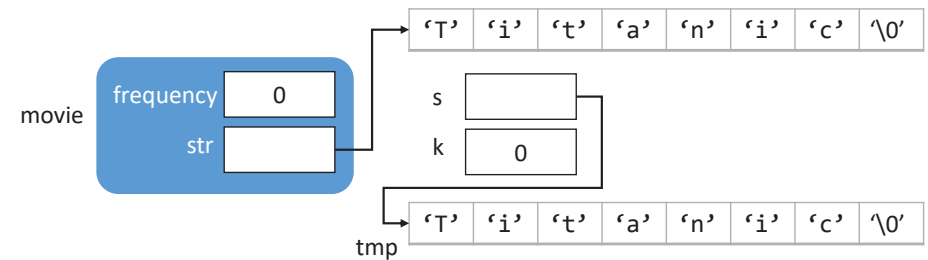
| 'T' | 'i' | 't' | 'a' | 'n' | 'i' | 'c' | '\0' |

movie: frequency `0`, str →

s

k `0`

| 'T' | 'i' | 't' | 'a' | 'n' | 'i' | 'c' | '\0' | (tmp)

Bottom-left:

```cpp
#include <cstring> /* File: default-assign-bug.cpp */
class Word
{
  private:
    int frequency; char* str;
  public:
    Word() : frequency(0), str(nullptr) { }
    Word(const char* s, int k = 0): frequency(k)
        { str = new char [strlen(s)+1]; strcpy(str, s); }
    ~Word() { delete [] str; }
};

void Bug(Word& x) { Word bug("bug", 4); x = bug; }

int main() { Word movie("Titanic"); Bug(movie); return 0; }
```
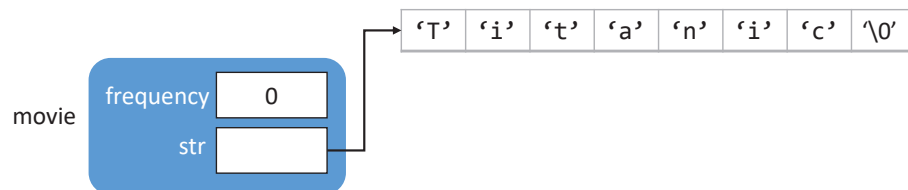
| 'T' | 'i' | 't' | 'a' | 'n' | 'i' | 'c' | '\0' |

movie: frequency `0`, str →

Bottom-right:

```cpp
#include <cstring> /* File: default-assign-bug.cpp */
class Word
{
  private:
    int frequency; char* str;
  public:
    Word() : frequency(0), str(nullptr) { }
    Word(const char* s, int k = 0): frequency(k)
        { str = new char [strlen(s)+1]; strcpy(str, s); }
    ~Word() { delete [] str; }
};

void Bug(Word& x) { Word bug("bug", 4); x = bug; }

int main() { Word movie("Titanic"); Bug(movie); return 0; }
```
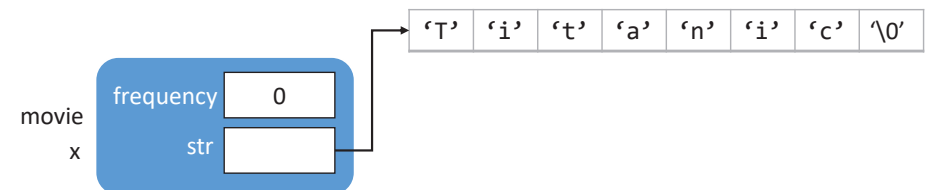
| 'T' | 'i' | 't' | 'a' | 'n' | 'i' | 'c' | '\0' |

movie / x: frequency `0`, str →

Top-left panel:

```cpp
#include <cstring> /* File: default-assign-bug.cpp */
class Word
{
  private:
    int frequency; char* str;
  public:
    Word() : frequency(0), str(nullptr) { }
    Word(const char* s, int k = 0): frequency(k)
        { str = new char [strlen(s)+1]; strcpy(str, s); }
    ~Word() { delete [] str; }
};

void Bug(Word& x) { Word bug("bug", 4); x = bug; }

int main() { Word movie("Titanic"); Bug(movie); return 0; }
```
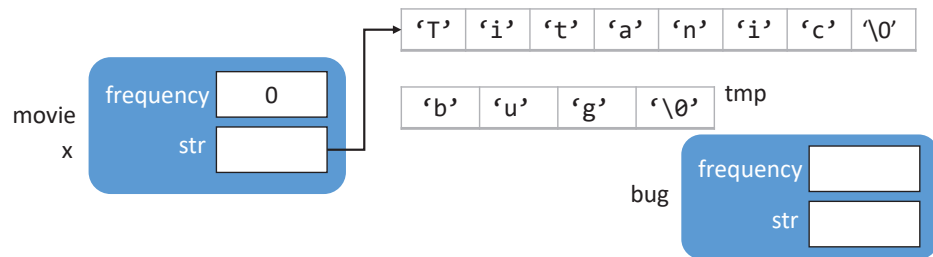
| 'T' | 'i' | 't' | 'a' | 'n' | 'i' | 'c' | '\0' |

movie / x : frequency 0, str →

| 'b' | 'u' | 'g' | '\0' | tmp

bug : frequency [ ], str [ ]

Top-right panel:

```cpp
#include <cstring> /* File: default-assign-bug.cpp */
class Word
{
  private:
    int frequency; char* str;
  public:
    Word() : frequency(0), str(nullptr) { }
    Word(const char* s, int k = 0): frequency(k)
        { str = new char [strlen(s)+1]; strcpy(str, s); }
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};

void Bug(Word& x) { Word bug("bug", 4); x = bug; }

int main() { Word movie("Titanic"); Bug(movie); return 0; }
```
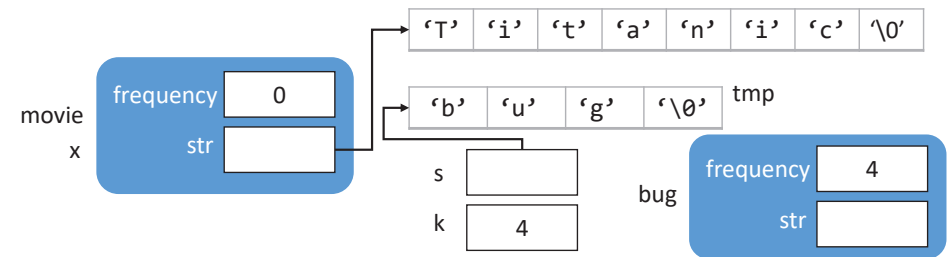
| 'T' | 'i' | 't' | 'a' | 'n' | 'i' | 'c' | '\0' |

movie / x : frequency 0, str →

| 'b' | 'u' | 'g' | '\0' | tmp

s [ ]
k 4

bug : frequency 4, str [ ]

Bottom-left panel:

```cpp
#include <cstring> /* File: default-assign-bug.cpp */
class Word
{
  private:
    int frequency; char* str;
  public:
    Word() : frequency(0), str(nullptr) { }
    Word(const char* s, int k = 0): frequency(k)
        { str = new char [strlen(s)+1]; strcpy(str, s); }
    ~Word() { delete [] str; }
};

void Bug(Word& x) { Word bug("bug", 4); x = bug; }

int main() { Word movie("Titanic"); Bug(movie); return 0; }
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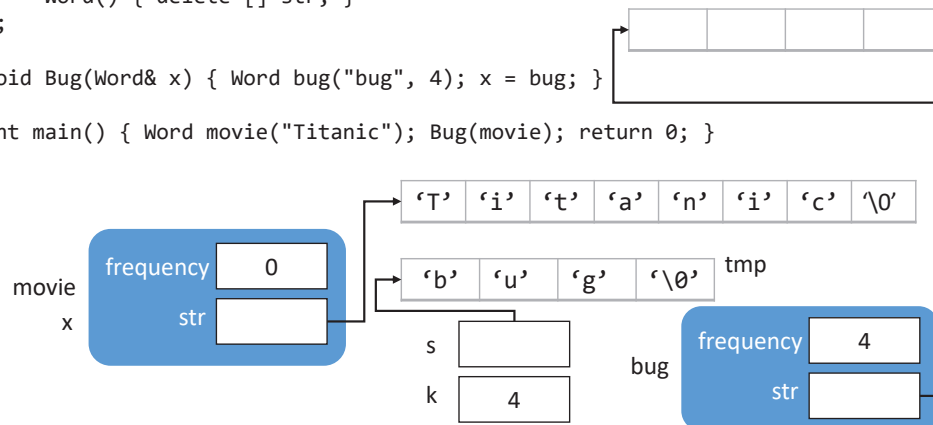
| | | | |

| 'T' | 'i' | 't' | 'a' | 'n' | 'i' | 'c' | '\0' |

movie / x : frequency 0, str →

| 'b' | 'u' | 'g' | '\0' | tmp

s [ ]
k 4

bug : frequency 4, str [ ]

Bottom-right panel:

```cpp
#include <cstring> /* File: default-assign-bug.cpp */
class Word
{
  private:
    int frequency; char* str;
  public:
    Word() : frequency(0), str(nullptr) { }
    Word(const char* s, int k = 0): frequency(k)
        { str = new char [strlen(s)+1]; strcpy(str, s); }
    ~Word() { delete [] str; }
};

void Bug(Word& x) { Word bug("bug", 4); x = bug; }

int main() { Word movie("Titanic"); Bug(movie); return 0; }
```
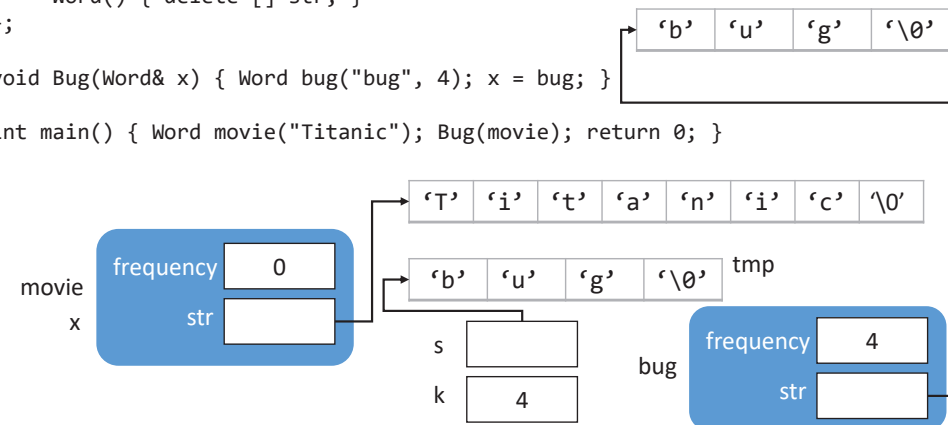
| 'b' | 'u' | 'g' | '\0' |

| 'T' | 'i' | 't' | 'a' | 'n' | 'i' | 'c' | '\0' |

movie / x : frequency 0, str →

| 'b' | 'u' | 'g' | '\0' | tmp

s [ ]
k 4

bug : frequency 4, str [ ]

Panel 1 (top-left)

```cpp
#include <cstring> /* File: default-assign-bug.cpp */
class Word
{
  private:
    int frequency; char* str;
  public:
    Word() : frequency(0), str(nullptr) { }
    Word(const char* s, int k = 0): frequency(k)
        { str = new char [strlen(s)+1]; strcpy(str, s);  }
    ~Word() { delete [] str; }
};

void Bug(Word& x) { Word bug("bug", 4); x = bug; }

int main() { Word movie("Titanic"); Bug(movie); return 0; }
```
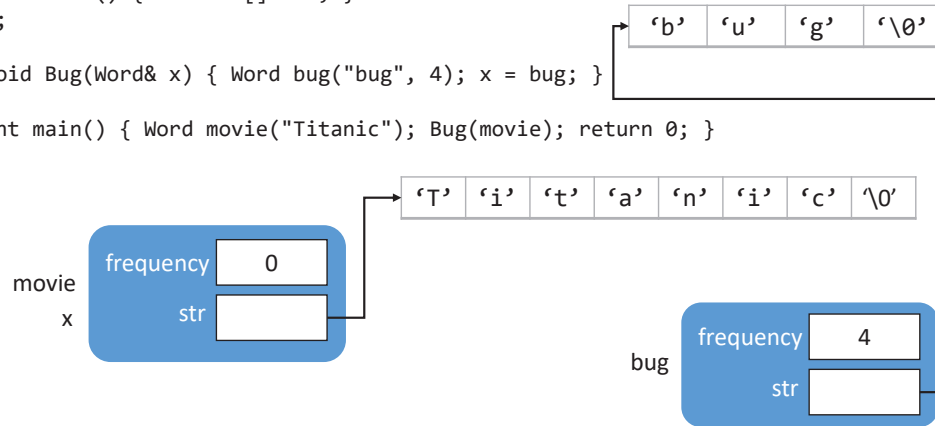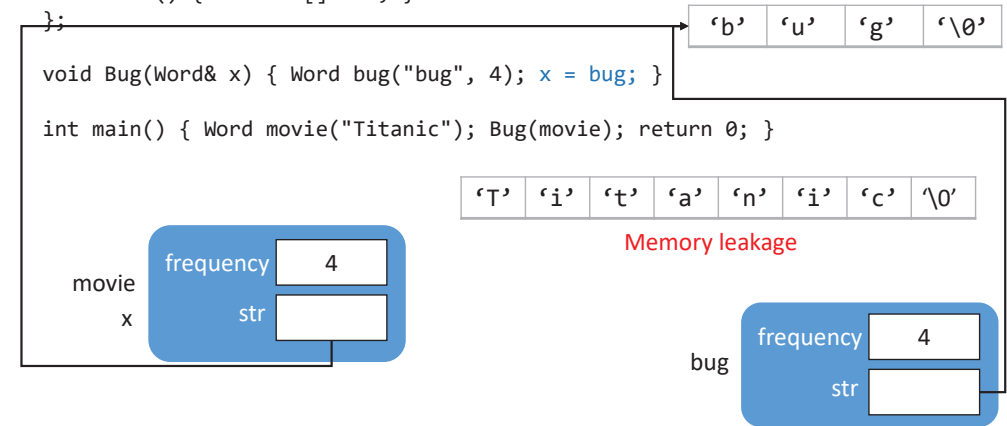
'b' 'u' 'g' '\0'

'T' 'i' 't' 'a' 'n' 'i' 'c' '\0'

movie
x
frequency 0
str

bug
frequency 4
str

Panel 2 (top-right)

```cpp
#include <cstring> /* File: default-assign-bug.cpp */
class Word
{
  private:
    int frequency; char* str;
  public:
    Word() : frequency(0), str(nullptr) { }
    Word(const char* s, int k = 0): frequency(k)
        { str = new char [strlen(s)+1]; strcpy(str, s); }
    ~Word() { delete [] str; }
};

void Bug(Word& x) { Word bug("bug", 4); x = bug; }

int main() { Word movie("Titanic"); Bug(movie); return 0; }
```
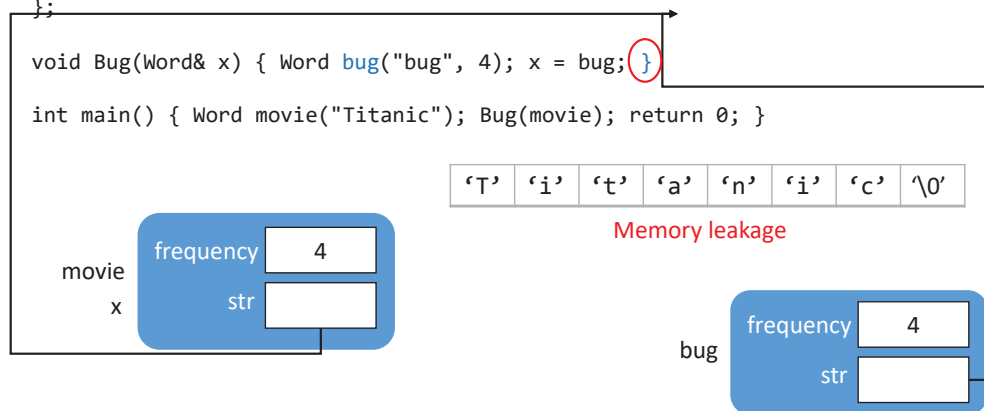
'b' 'u' 'g' '\0'

'T' 'i' 't' 'a' 'n' 'i' 'c' '\0'
Memory leakage

movie
x
frequency 4
str

bug
frequency 4
str

Panel 3 (bottom-left)

```cpp
#include <cstring> /* File: default-assign-bug.cpp */
class Word
{
  private:
    int frequency; char* str;
  public:
    Word() : frequency(0), str(nullptr) { }
    Word(const char* s, int k = 0): frequency(k)
        { str = new char [strlen(s)+1]; strcpy(str, s); }
    ~Word() { delete [] str; }
};

void Bug(Word& x) { Word bug("bug", 4); x = bug;  }

int main() { Word movie("Titanic"); Bug(movie); return 0; }
```
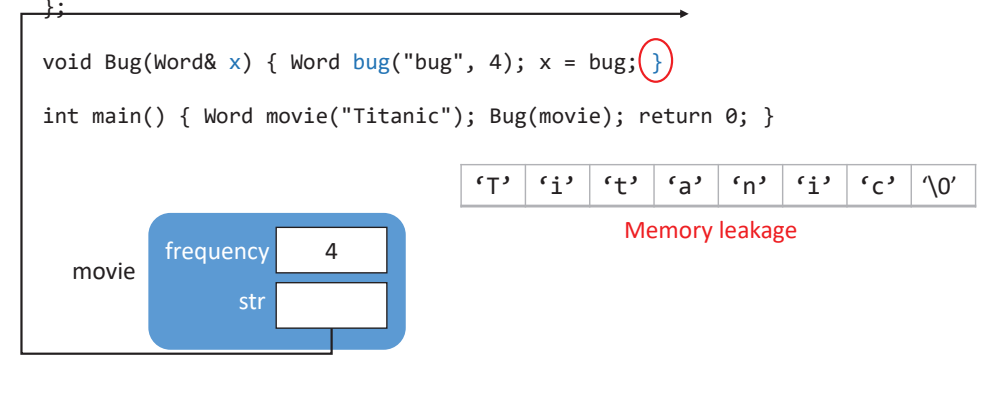
'T' 'i' 't' 'a' 'n' 'i' 'c' '\0'
Memory leakage

movie
x
frequency 4
str

bug
frequency 4
str

Panel 4 (bottom-right)

```cpp
#include <cstring> /* File: default-assign-bug.cpp */
class Word
{
  private:
    int frequency; char* str;
  public:
    Word() : frequency(0), str(nullptr) { }
    Word(const char* s, int k = 0): frequency(k)
        { str = new char [strlen(s)+1]; strcpy(str, s); }
    ~Word() { delete [] str; }
};

void Bug(Word& x) { Word bug("bug", 4); x = bug; }

int main() { Word movie("Titanic"); Bug(movie); return 0; }
```

'T' 'i' 't' 'a' 'n' 'i' 'c' '\0'
Memory leakage

movie
frequency 4
str

```cpp
#include <cstring> /* File: default-assign-bug.cpp */
class Word
{
  private:
    int frequency; char* str;
  public:
    Word() : frequency(0), str(nullptr) { }
    Word(const char* s, int k = 0): frequency(k)
        { str = new char [strlen(s)+1]; strcpy(str, s); }
    ~Word() { delete [] str; }
};

void Bug(Word& x) { Word bug("bug", 4); x = bug; }

int main() { Word movie("Titanic"); Bug(movie); return 0; }
```

Runtime error!

| 'T' | 'i' | 't' | 'a' | 'n' | 'i' | 'c' | '\0' |

Memory leakage

movie

| frequency | 4 |
| str | |