

# Wstęp do informatyki wykład 2, Systemy liczbowe z ograniczoną długością rejestru.

Rafał Grot

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**12**  $\mathbf{NKB}_{(N)} \rightarrow \mathbf{NKB}_{(M)}, M < N$   
**i**  $\mathbf{U2}_{(N)} \rightarrow \mathbf{U2}_{(M)}, M < N$

**5**

## 1 System $\mathbf{NKB}_{(N)}$

Rejestr: 

$a_{N-1}$	$a_{N-2}$	$\dots$	$a_1$	$a_0$
-----------	-----------	---------	-------	-------

  
Wagi cyfr:  $\frac{\quad}{2^{N-1}} \quad \frac{\quad}{2^{N-2}} \quad \quad \frac{\quad}{2^1} \quad \frac{\quad}{2^0}$   
Zakres:  $L_{\mathbf{NKB}}(N) = [0, 2^N - 1]$

## 2 System $\mathbf{U2}_{(N)}$

Rejestr: 

$a_{N-1}$	$a_{N-2}$	$\dots$	$a_1$	$a_0$
-----------	-----------	---------	-------	-------

  
Wagi cyfr:  $\frac{\quad}{-2^{N-1}} \quad \frac{\quad}{2^{N-2}} \quad \quad \frac{\quad}{2^1} \quad \frac{\quad}{2^0}$   
Zakres:  $L_{\mathbf{U2}(N)} = [-2^{N-1}, 2^{N-1} - 1]$

## 3 $\mathbf{DEC} \rightarrow \mathbf{NKB}_{(N)}$

$L_{\mathbf{DEC}} : 2 = W_0 \quad R_0$   
 $W_0 : 2 = W_1 \quad R_1$   
 $\vdots \quad \vdots$   
 $\frac{W_{N-2} : 2 = W_{N-1} \quad R_{N-1}}{W_{N-1} : 2 = W_N \quad R_N}$   
 $W_N : 2 = W_{N+1} \quad R_{N+1}$   
 $\vdots \quad \vdots$   
 $W_{M-1} : 2 = 0 \quad R_{M-1}$

## 4 $\mathbf{NKB}_N \rightarrow \mathbf{DEC}$

$$L_{\mathbf{DEC}} = \sum_{i=0}^{N-1} a_i \times 2^i$$

## 5 $\mathbf{DEC} \rightarrow \mathbf{U2}_{(N)}$

1.  $\mathbf{DEC} \rightarrow \mathbf{NKB}_{(N)}$
2.
  - Dla  $L_{\mathbf{DEC} \geq 0}$  KONIEC;

- Dla  $L_{\text{DEC} < 0}$  Zamiana znaku

### 5.1 Zamiana znaku

$$\begin{aligned}
 \text{a)} \quad & \begin{array}{|c|c|c|c|c|} \hline a_{N-1} & a_{N-2} & \dots & a_1 & a_2 \\ \hline \end{array} = A_{U2(N)} = L_{\text{DEC}} \\
 \text{b)} \quad & \begin{array}{|c|c|c|c|c|} \hline \overline{a_{N-1}} & \overline{a_{N-2}} & \dots & \overline{a_1} & \overline{a_2} \\ \hline \end{array} \\
 + \quad & \begin{array}{|c|c|c|c|c|} \hline 0 & 0 & \dots & 0 & 1 \\ \hline \end{array} \\
 = \quad & \begin{array}{|c|c|c|c|c|} \hline b_{(N-1)} & b_{(N-2)} & \dots & b_1 & b_2 \\ \hline \end{array} = B_{U2(N)} = L_{\text{DEC}}
 \end{aligned}$$

### 5.2 Warunek

$$L_{\text{DEC}} = [-2^{N-1}, 2^{N-1} - 1]$$

Innaczej się nie zmieści w rejestrze

### 5.3 Przykłady

#### 5.3.1 $L_{\text{DEC}} = 127$

$$\begin{aligned}
 L_{\text{NKB}} &= 01111111 \\
 L_{U2} &= 01111111
 \end{aligned}$$

#### 5.3.2 $L_{\text{DEC}} = -127$

$$\begin{aligned}
 |L_{\text{DEC}}| = L_{\text{NKB}(8)} &= \begin{array}{r} 01111111 \\ 10000000 \\ + \quad 00000001 \\ \hline 10000001_{U2(8)} \end{array} = -128
 \end{aligned}$$

#### 5.3.3 $L_{\text{DEC}} = 128$

$$\begin{aligned}
 L_{\text{NKB}(8)} &= 10000000_{\text{NKB}(8)} \\
 L_{U2(8)} &\neq 10000000_{U2(8)} = -128_{\text{DEC}}
 \end{aligned}$$

#### 5.3.4 $L_{\text{DEC}} = -128$

$$\begin{aligned}
 |L_{\text{DEC}}| &= \begin{array}{r} 10000000 \\ 01111111 \\ + \quad 00000001 \\ \hline 10000000_{U2(8)} \end{array} = -128
 \end{aligned}$$

## 6 $\mathbf{NKB}_N \rightarrow \mathbf{U2}_N$

Nie istnieje!  
Zmiana Interpretacji

## 7 $\mathbf{NKB}_N \rightarrow \mathbf{U2}_{M, M > N}$

Istnieje

## 8 $\mathbf{U2}_{(N)} \rightarrow \mathbf{NKB}_{(N)}$

Nie istnieje

## 9 $\mathbf{U2}_{(M)} \rightarrow \mathbf{NKB}_{(N)}$

Nie istnieje dla dowolnego  $M > 0, N > 0$ .

## 10 Jakies pierdoły

- $A_{\text{DEC}} = 128$
- $B_{\text{DEC}} = 127$
- $A_{\text{U2}(8)} > B_{\text{U2}(8)} = \text{FALSE}$
- $A_{\text{U2}(16)} > B_{\text{U2}(16)} = \text{TRUE}$

## 11 $\mathbf{NKB}_N \rightarrow \mathbf{NKB}_{(8), M > N}$

•

$$L_{\mathbf{NKB}_{(N)}} = \begin{array}{|c|c|c|c|c|} \hline a_{N-1} & a_{N-2} & \dots & a_1 & a_0 \\ \hline \end{array} \mathbf{NKB}_{(N)}$$

•

$$L_{\mathbf{NKB}_{(M)}} = \begin{array}{|c|c|c|c|c|c|c|c|} \hline 0 & 0 & \dots & a_{N-1} & a_{N-2} & \dots & a_1 & a_0 \\ \hline \end{array} \mathbf{NKB}_{(N)}$$

$$\begin{aligned}
\mathbf{12} \quad & \mathbf{NKB}_{(N)} \rightarrow \mathbf{NKB}_{(M)}, M < N \\
& \mathbf{i} \mathbf{U2}_{(N)} \rightarrow \mathbf{U2}_{(M)}, M < N
\end{aligned}$$

$$\begin{aligned}
\mathbf{L}_{\mathbf{NKB}(N)} &= \begin{array}{|c|c|c|c|c|} \hline \mathbf{a}_{N-1} & \mathbf{a}_{N-2} & \dots & \mathbf{a}_1 & \mathbf{a}_0 \\ \hline \end{array} \\
\mathbf{L}_{\mathbf{NKB}(M)} &= \begin{array}{|c|c|c|c|} \hline \mathbf{a}_{M-2} & \dots & \mathbf{a}_1 & \mathbf{a}_0 \\ \hline \end{array}
\end{aligned}$$