

# Muzyka algorytmiczna, wykład 5

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# Zapisywanie w midi

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```
writeMidi "twinkle.mid" twinkle
```

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## Generowanie losowych ciągów

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```
import System.Random
```

```
—Standardowy pseudo-losowy generator liczb
```

```
data StdGen = System.Random.StdGen
```

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```
mkStdGen :: Int -> StdGen — konstruktor generatora
```

```
zarodek = mkStdGen 67543
```

```
next :: StdGen -> (Int, StdGen) — funkcja
```

```
kolejna = next zarodek
```

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```
liczby :: Int -> StdGen -> [Int]
liczby 0 g = []
liczby n g = b : liczby (n-1) g'
           where
               (b,g') = next g
```

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—metoda `randomR`

`randomR` :: `RandomGen`  $g \Rightarrow (a, a) \rightarrow g \rightarrow (a, g)$

— `RandomGen` obiekt klasy `StdGen`

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`liczby2` :: `Int`  $\rightarrow$  `StdGen`  $\rightarrow$  [`Int`]

`liczby2` 0  $g$  = []

`liczby2`  $n$   $g$  =  $b$  : `liczby2` ( $n-1$ )  $g'$

where

$(b, g') = \text{randomR } (10, 20) \ g$

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—metoda `randomRs`

`randomRs` :: `RandomGen`  $g \Rightarrow (a, a) \rightarrow g \rightarrow [a]$

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`zarodek = mkStdGen 67543`

`losoweliczby = randomRs (50,80) (zarodek)`

`losowedzwiaki = map (note tn) losoweliczby`

`random1 = line losowedzwiaki`

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```
randomMuz :: Music AbsPitch
randomMuz = line $ take 30 $ map (note sn)
    $ randomRs (56,86) (mkStdGen 67543)
m = (Modify (Instrument Marimba) randomMuz)
```

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Funkcja losujące elementy z listy

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```
losujZ :: [a] -> StdGen -> (a, StdGen)
```

```
losujZ [] g = error "Nie mam co wybrac"
```

```
losujZ xs g =  
    let (i, g') = next g  
    in  (xs !! (mod i (length xs)), g')
```

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```
mazurek= [c 5 en, e 5 en, c 5 qn, e 5 qn,  
          g 5 en, fs 5 en, d 5 qn, f 5 en,  
          e 5 en, c 5 en, e 5 en, c 5 qn, e 5 qn, g 5 hn]
```

---

```
wariacje 0 g = rest wn
```

```
wariacje n g = m :+: wariacje (n-1) g'
```

where

```
(m,g') = losujZ mazurek g
```

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```
melodyjka :: StdGen -> Music (AbsPitch, Volume)
melodyjka g =
  let (dlugosc, g0) = losujZ [qn, en, en] g
      (wys, g1) = losujZ [64, 65, 67, 68] g0
      (glos, g2) = losujZ [0..100] g1
  x | glos < 20 = rest dlugosc
    | glos >= 20 = note dlugosc (wys, glos)
  in x :+: melodyjka g2
```

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