

Kynning

mánudaginn 10. september 2018
í Háskólanum í Reykjavík
stofu M104

Kosningakerfahermir

Ágrip

- Hugbúnaður til prófunar á tvívíðu kosningakerfi eins og því íslenska
- **Velja má**
 - uppskiptingu í kjördæmi
 - skiptingu og tölu kjördæmis- og jöfnunarsæta
 - grunnúthlutunaraðferð
 - þröskuldur eða ekki o.s.frv.
- Leggja má raunverulega eða dæmigerða skipan flokka og fylgis þeirra til grundvallar
- Búin eru til mörg slembikennd kosningaúrslit (t.d. 10.000) sem snúast kringum hin inngefnu úrslit
- Fundin er meðaltalsúthlutun, staðalfrávik svo og alls kyns gæðamælikvarðar reiknaðir
 - (ENN sem komið er ekki fengist við persónukjör)

Aðstandendur, markmið og fyrirvarar

- „Kosningafræðaklúbburinn“; sjá fésbók; einkum þessir:
 - Martha Guðrún Bjarnadóttir, nemi við HR í tölvunarstærðfræði, með styrk úr Nýsköpunarsjóði námsmanna, nr. 185597-0091
 - Pétur Ólafur Aðalgeirsson, forritun og stærðfræði
 - Smári McCarthy, hugbúnaðarhönnun
 - Þorkell Helgason, fræðilegur bakgrunnur
- Markmið
 - Verkfæri til að prófa mismunandi fyrirkomulag við skipan kjördæma og úthlutunaraðferða
 - Upphaflega fræðilegs eðlis, þ.e.a.s. að þróa og prófa nálgunaraðferðir á svokallaðri bestu úthlutunaraðferð
- Ekki verið að leggja til tilteknar breytingar
 - En hugbúnaðurinn er tól til þess

Fræðin að baki

Þorkell Helgason

Tvívíð úthlutun í hnotskurn

- Landinu er skipt upp í *kjördæmi*
- Hluti þingsæta hvers kjördæmis eru *kjördæmissæti*
 - Þeim er úthlutað hlutfallslega á grundvelli úrslita innan hvers þeirra
 - með reglu d'Hondts, Sainte-Laguë eða með öðrum hætti
- Önnur sæti eru til jöfnunar á milli flokka, *jöfnunarsæti*
 - Skipt á milli kjördæma áður en kosið er
 - Skipt upp á milli flokka eftir landsfylgi (í kjölfar kjördæmissæta)
 - með reglu d'Hondts, Sainte-Laguë eða með öðrum hætti
 - að gefnum lágmarksþröskulti ef við á
- Að lokum er jöfnunarsætum útdeilt til einstakra lista
 - innan flokka og kjördæma

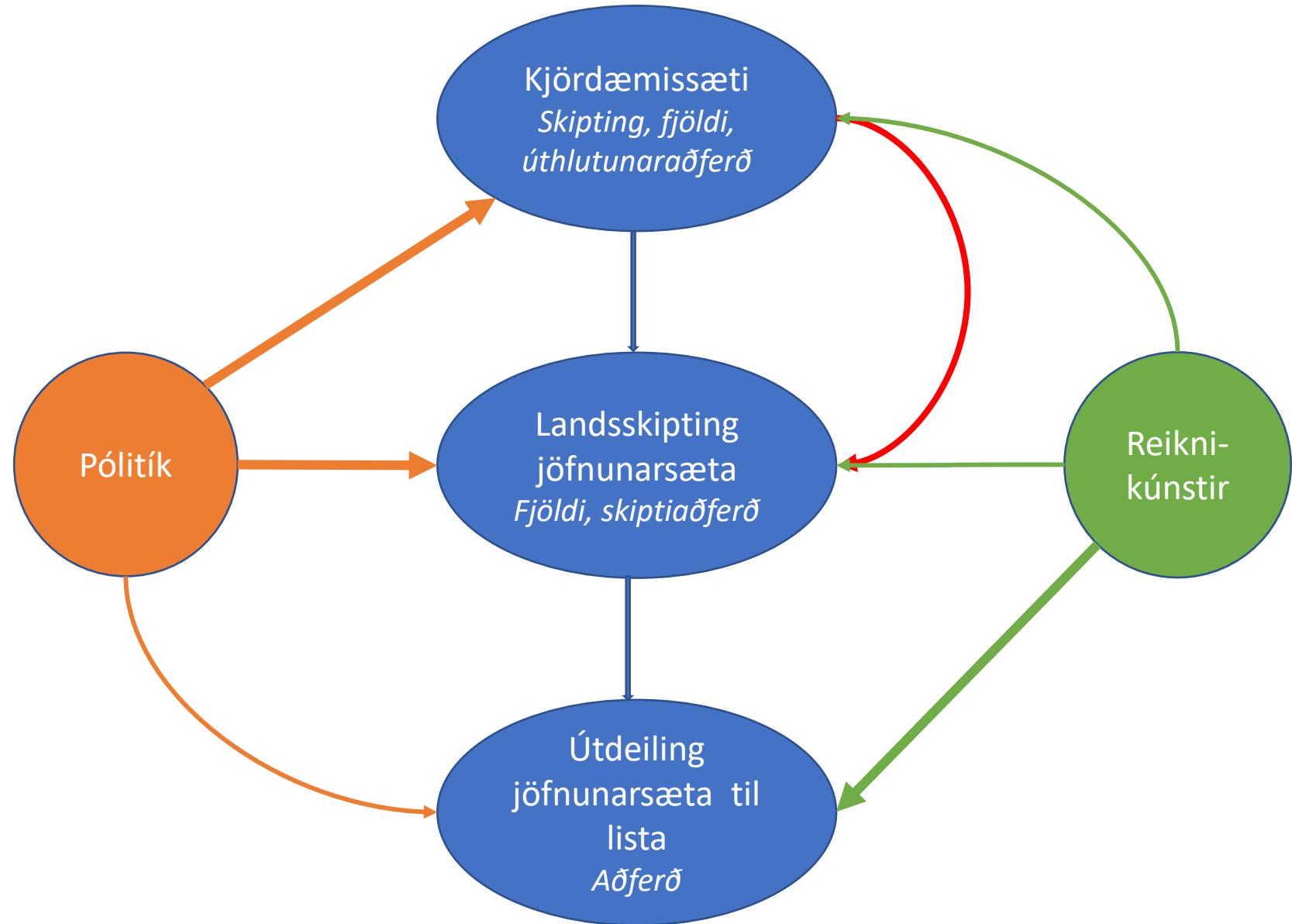
Viðfangsefni tvívíðrar úthlutunar

*er að fylla út í töfluna
þannig að summur lóðrétt og lárétt séu réttar
um leið og úthlutunin sé í sem bestu "hlutfalli" við atkvæði greidd einstökum listum.
(Kosningar 2003 sem dæmi)*

Listabókstafur:	B	D	F	S	U	Sæti alls	þar af kjörd.s.	þar af jöfnunars.
Norðvesturkjördæmi						10	9	1
Norðausturkjördæmi						10	9	1
Suðurkjördæmi			?			10	9	1
Suðvesturkjördæmi						11	9	2
Reykjavíkurkjördæmi suður						11	9	2
Reykjavíkurkjördæmi norður						11	9	2
Heildartala þingsæta	12	22	4	20	5	63	54	9
<i>þar afkjördæmissæti</i>	<i>11</i>	<i>19</i>	<i>2</i>	<i>18</i>	<i>4</i>	<i>54</i>		
<i>þar afjöfnunarsæti</i>	<i>1</i>	<i>3</i>	<i>2</i>	<i>2</i>	<i>1</i>	<i>9</i>		

Á við Ísland, Noreg og mörg fleiri ríki eða svæði

Tvívíð úthlutun: þættir og áhuga- valdar



Kröfur (að hætti Balinski og Demange) til “gæðalausnar”

(alltaf að gefinni heildarskiptingu sæta milli kjördæma og á milli flokka)

- **Kjörfylgi og þingfylgi haldist í hendur**
 - Listi skal aldrei tapa sætum, auki hann fylgi sitt
 - Og öfugt, minnki fylgið
- **Innra samræmi aðferðarinnar**
 - Breytingar á atkvæðum einstakra lista, sem valda þó ekki neinni breytingu á úthlutun til þeirra, mega ekki hrófla við úthlutun til annarra lista
- **Óháð skölun**
 - Einvíð skölun á atkvæðum innan einstakra kjördæma skal engu breyta
 - Ekki heldur ef atkvæði flokka eru sköluð (umdeilanleg krafa)
- **Grunnkröfur**
 - Nokkrar einfaldar, rökfræðilegar kröfur

Hvernig verður þá best úthlutað?

Sannað hefur verið að

- aðeins er til „ein” lausn, „ein” aðferð sem leysir vandann og virðir allar gæðakröfur

Hver er hún?

- Sætunum (jöfnunarsætum) skal útdeilt þannig að heildarmargfeldi atkvæða að baki þingsætum sé í hámarki
- Stærðfræðilega einfalt og skýrt markmið
- Stuttur lagatexti

Tvívíð gæðaúthlutun sem línuleg bestun

Lágmörkun
óreiðu:

Entropy LP-problem

$$\max \left[\sum_i \sum_j \sum_k \ln \left(\frac{V_{ij}}{d_k} \right) x_{ijk} \right]$$

subject to the constraints

$$\sum_j \sum_k x_{ijk} = C_i \quad \forall i$$

$$\sum_i \sum_k x_{ijk} = P_j \quad \forall j$$

$$\sum_i \sum_j \sum_k x_{ijk} = A$$

$$\sum_k x_{ijk} \geq m_{ij} \quad \forall i, j$$

$$0 \leq x_{ijk} \leq 1 \quad \forall i, j, k$$

Raunúthlutun 2003 – færð til bestu lausnar

Eina leiðréttin sem gera þarf er í
í Suðurkjördæmi og Reykjavíkurkjördæmi norður

Breyting á heildarúthlutun þingsæta með „bestu“ úthlutun.

Listabókstafur:	B	D	F	N	S	T	U	Alls
Norðvesturkjördæmi	2	3	2	-	2	-	1	10
Norðausturkjördæmi	4	2	-	-	2	-	2	10
Suðurkjördæmi	2+1	3	1	-	4-1	-	-	10
Suðvesturkjördæmi	1	5	1	-	4	-	-	11
Reykjavíkurkjördæmi suður	1	5	-	-	4	-	1	11
Reykjavíkurkjördæmi norður	2-1	4	-	-	4+1	-	1	11
Heildartala þingsæta	12	22	4	-	20	-	5	63

Kosningarnar 2003

Tilraun með breytingu á úthlutun

Litaðar tölur sýna atkvæði að baki sæti; grænar vísa til þeirra lista sem fá viðbótarsæti og gular til þeirra sem eru látnir missa sæti

Listabókstafur:	Úthlutun skv. lögunum		Breytt úthlutun		Hlutfallsleg stækkun atkvæða- margfeldis- ins við breytinguna:
	B	S	B	S	
Suðurkjördæmi	2.967	1.857	1.978	2.475	
Reykjavíkurkjördæmi norður	2.100	3.278	4.199	2.622	
Margfeldi reitanna fjögurra	37.902.781.266.699		53.906.177.801.528		42%

Hvernig leyfist að úthluta sætum?

Gæðaúthlutunin fæst aðeins með ítrun

- Hið stærðfræðilega flækjustig er þannig vaxið að besta lausnin verður aldrei fundin án ítrana, þ.e.a.s. runu tilraunaúthlutana þar til endanlega lausnin er fundin

Seilingaraðferðir

- Hér er átt við að sætum sé úthlutað í bunu, einu sæti í senn á grundvelli einhvers mælikvarða. Aldrei er horft um öxl og fyrri úthlutun dregin til baka

Pólitískt leyfilegt

- Hvorki stjórnmálamenn né lögfræðingar eru ginnkeyptir fyrir ítrunum.
- Því koma aðeins seilingaraðferðir til álita

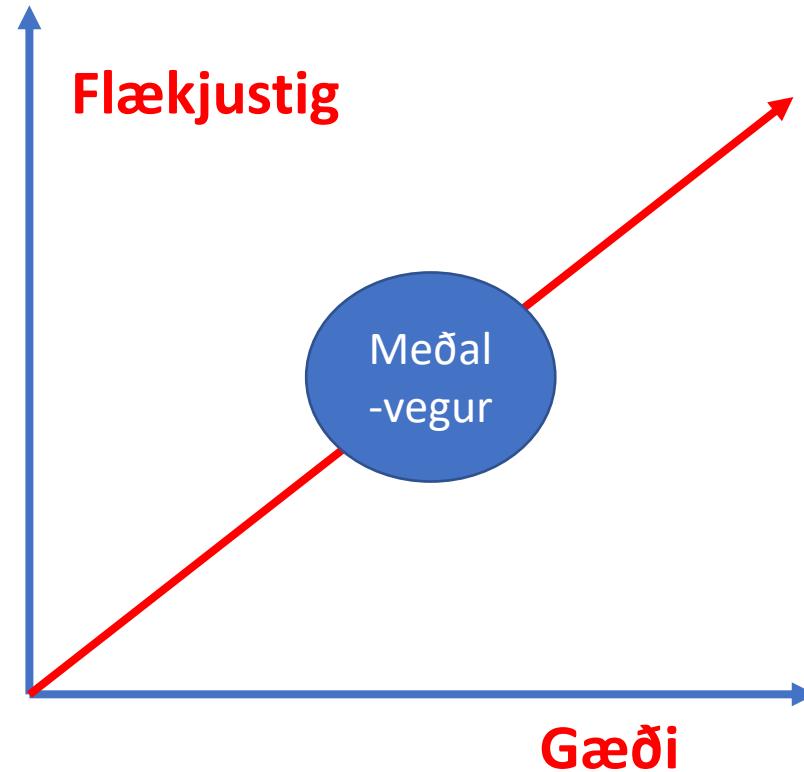
Nálgunarleiðir að bestu lausn

Pólískar kröfur

- Sætum verður að úthluta í halarófu, aldrei má líta um öxl
- Ekki of flóknar

Gæðakrafa

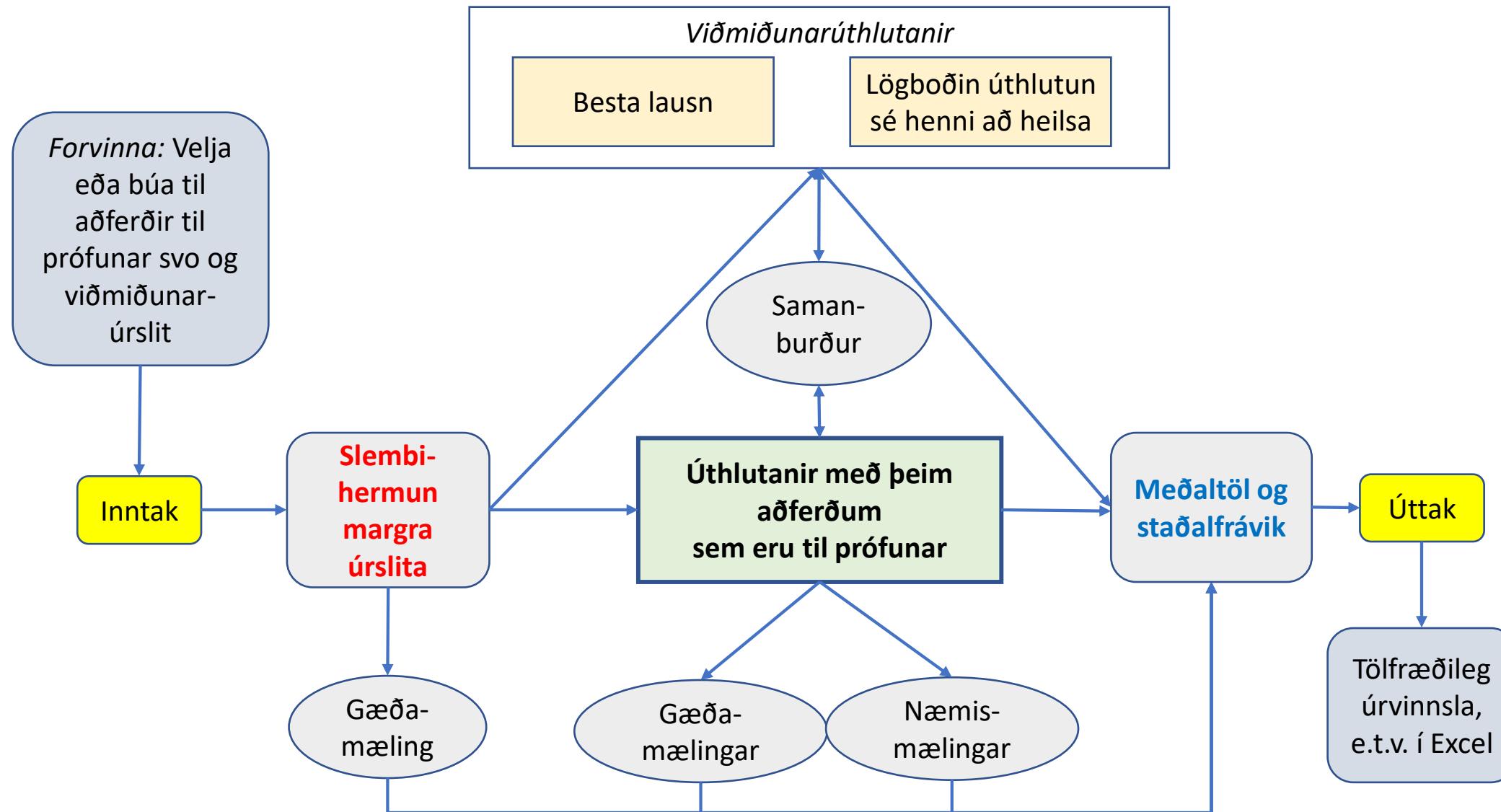
- Líkja sem næst eftir bestu lausn, „gæðalausninni“



Aðferðir sem hafa verið forritaðar

- Gæðaaðferðin
- Íslensk og norsk lög, svo og „íslenskuð“ útgáfa þeirra norsku
- Forskotsaðferð (ÞH)
- Víxlunaraðferð (KL og ÞH)
- Aðferð kennd við Monge (ÞH, PÓA)
- O.fl. í bígerð

Einföld mynd af kosningakerfisherminum



Gæðamælikvarðar

- Viðmið við bestu lausn
 - Frávik margfeldis atkvæða að baki sæta
 - Frávik tölu sæta
- Kjördæmafrávik
 - Hve oft verður að víkja frá hreinni kjördæmisúthlutun
- Hlutfallsleg úthlutun
 - Loosmore og Hanby kvarðinn (útfærður fyrir tvívídd)
- Mælikvarðar á grundvelli grunnaðferða
 - Laguë
 - d'Hondt (tveir slíkir)

LHMethod

$$:= \frac{1}{SeatsTotal} \sum_{i \in Constituencies} \sum_{j \in Parties} |BiSeatShares_{ij} - SeatsListMethod_{ij}|$$

LagueTestMethod

$$:= Scale \sum_{i \in Constituencies} \sum_{j \in Parties} \frac{(BiSeatShares_{ij} - SeatsListMethod_{ij})^2}{BiSeatShares_{ij}}$$

$$dHondtMinMethod := \min_{i \in Constituencies} \min_{j \in Parties} \frac{BiSeatShares_{ij}}{SeatsListMethod_{ij}}$$

$$dHondtSumMethod := 2 Scale \sum_{i \in Constituencies} \sum_{j \in Parties} \frac{(BiSeatShares_{ij} - SeatsListMethod_{ij})^+}{BiSeatShares_{ij}}$$

Sýning á hugbúnaðinum

Martha Guðrún Bjarnadóttir

[Voting](#) [Instructions](#) [Single Election](#) [Simulate](#)

Voting system simulator

Hello! This is a voting system simulator. Above, you can choose between two modes: [Single Election](#) and [Simulate](#).

About

The aim of this software is to help people understand how certain types of voting systems work under various conditions. It provides tools to calculate election results for certain systems and review various metrics for these systems under simulation.

This software is free to use for experimental purposes, and is free/open source software, available from [Github](#). If you are using it for commercial or political reasons, please contact us to discuss supporting our project financially.

The voting system simulator is made by:

- Smári McCarthy (smarim@althingi.is)
- Þorkell Helgason (thorkellhelga@gmail.com)
- Martha Guðrún Bjarnadóttir
- Pétur Ólafur Aðalgeirsson
- Helgi Hrafn Gunnarsson
- Bjartur Thorlacius

Single Election

[Single Election](#) allows you to calculate the results of a single election. You need to provide **election rules** along with information about the **constituencies** in the country, the **parties** running in the election, and the **votes** each party got in each constituency.



Single Election

Single Election allows you to calculate the results of a single election. You need to provide **election rules** along with information about the **constituencies** in the country, the **parties** running in the election, and the **votes** each party got in each constituency.

As you update these values, the result will be automatically calculated and the results displayed below.

When choosing the *election rules*, you have a lot of different options to choose from — for a deeper understanding of these, you should read our guides on **divider rules** and **adjustment methods**.

[Run a single election](#)

Simulate

The **Simulate** function allows you to run hundreds or even thousands of elections, each differing slightly from the last, in order to gain insights into the behaviour of different *voting systems*.

By setting up several different systems, you can *compare* the statistical behaviour to see which systems do best under certain test conditions. The results are displayed in the form of several different **quality measures**, each with their own interpretation.

As with running a single election, you must provide information about the **constituencies** in the country, the **parties** running in the election, and the **votes** each party got in each constituency.

In addition to this, you must provide at least one set of **election rules** to be considered, but you can have as many rules as you'd like.

When choosing the *election rules*, you have a lot of different options to choose from — for a deeper understanding of these, you should read our guides on **divider rules** and **adjustment methods**.

[Run a simulation](#)

[Voting](#) [Instructions](#) [Single Election](#) [Simulate](#)

Election

Votes

[Add constituency](#)[Add party](#)[Clear votes](#)[Reset everything](#)[Upload votes](#)[Paste input](#)[Load preset](#)[Save voteset](#)

	# Cons.	# Adj.	x	A	x	B
x I	10	2	x	1500	x	2000
x II	10	3	x	2500	x	1700

Settings

Divider for allocating constituency seats

D'Hondt's method

Adjustment method

Icelandic law 24/2000 (Kosningar til Alþingis)

[Voting](#) [Instructions](#) [Single Election](#) [Simulate](#)

Election

Votes

[Add constituency](#)[Add party](#)[Clear votes](#)[Reset everything](#)[Upload votes](#)[Paste input](#)[Load preset](#)[Save voteset](#)

	# Cons.	# Adj.	x	A	x	B	x	C
x I	10	2	x 1500	2000	x 1459			
x II	10	3	x 2500	1700	x 1347			
x III	11	3	x 1877	3001	x 2345			

Settings

Divider for allocating constituency seats

D'Hondt's method

Adjustment method

Icelandic law 24/2000 (Kosningar til Alþingis)

[Voting](#) [Instructions](#) [Single Election](#) [Simulate](#)

Election

Votes

[Add constituency](#)[Add party](#)[Clear votes](#)[Reset everything](#)[Upload votes](#)[Paste input](#)[Load preset](#)[Save voteset](#)

	# Cons.	# Adj.	x	A	x	C
x II	10	3	x	2500	x	1347
x III	11	3	x	1877	x	2345

Settings

Divider for allocating constituency seats

D'Hondt's method

Adjustment method

Icelandic law 24/2000 (Kosningar til Alþingis)



Voting Instructions Single Election Simulate

Election

Votes

Add constituency

Add p

I

II

Settings

Divider for allocating constituency seats

D'Hondt's method

Adjustment method

Icelandic law 24/2000 (Kosningar til Alþingis)

Load preset



Name	Year	Country	Actions
Alþingi elections	2003	Iceland	<button>Load</button>
Alþingi elections	2007	Iceland	<button>Load</button>
Alþingi elections	2009	Iceland	<button>Load</button>
Alþingi elections	2013	Iceland	<button>Load</button>
Alþingi elections	2016	Iceland	<button>Load</button>

Cancel

OK

Voting

Not secure | voting.smarimccarthy.is/#/election

Votes

Add constituency Add party Clear votes Reset everything Upload votes Paste input Load preset Save voteset

	# Cons.	# Adj.	x	A	x	B	x	D	x	G	x	H	x	I	x
x Norðvestur	7	1	792	6104		4282		208		0		161		774	
x Norðaustur	9	1	1537	8173		5327		296		0		241		306	
x Suður	9	1	1202	9262		7594		702		0		786		412	
x Suðvestur	11	2	4687	10944		15608		925		0		1838		188	
x Reykjavík suður	9	2	3790	5931		9464		575		55		1394		161	
x Reykjavík norður	9	2	3576	5759		8180		556		71		1287		180	

Settings

Divider for allocating constituency seats

D'Hondt's method

Adjustment method

Icelandic law 24/2000 (Kosningar til Alþingis)

Voting Instructions Single Election Settings

Election Votes

Add constituency

Add party

I

II

Settings

Divider for allocating constituency seats

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Icelandic law 24/2000 (Kosningar til Alþingis)

Upload CSV or XLSX file

x

The file provided must be a CSV or an Excel XLSX file formatted with parties on the first row and constitution names on the first column.

	A	B	C	D	E	F	G
1		cons	adj	Lion Party	Gorilla Party	Antelope Party	Hippo Party
2	East Jungle		5	1	221	822	72
3	West Jungle		6	2	103	934	48
4	The Oasis		5	2	340	224	238
5	Pride Rock		7	1	1421	79	208
6	Northern Savannah		4	2	321	40	782
7	Southern Bush		5	2	144	53	833
8							393

Optionally, if the second and third columns are named 'cons' or 'adj', they will be understood to be information about the number of constituency seats and adjustment seats, respectively, in each constituency. If you leave them out, you can specify the number of seats manually.

Choose a file...

Browse

Cancel

OK

[Voting](#) [Instructions](#) [Single Election](#) [Simulate](#)

Election

Votes

[Add constituency](#)[Add party](#)[Clear votes](#)[Reset everything](#)[Upload votes](#)[Paste input](#)[Load preset](#)[Save voteset](#)

	# Cons.	# Adj.	x	A	x	B	x	C	x	D	x	E
x Norður	4	3	6817	4548		2638		1889		956		
x Austur	4	3	8410	5739		3964		1139		859		
x Suður	4	3	4360	3118		2067		1183		1266		
x Vestur	4	3	8091	6718		2066		1796		1677		

Settings

Divider for allocating constituency seats

D'Hondt's method

Adjustment method

Icelandic law 24/2000 (Kosningar til Alþingis)



Settings

Divider for allocating constituency seats

D'Hondt's method

Which divider rule should be used to allocate constituency seats to lists within each constituency?

Divider for apportioning adjustment seats

D'Hondt's method

Which divider rule should be used to apportion adjustment seats among parties?

Divider for allocating adjustment seats

D'Hondt's method

Which divider rule should be used to allocate adjustment seats to individual lists?

Adjustment method

Icelandic law 24/2000 (Kosningar til Alþingis)

Which method should be used to allocate adjustment seats?

Adjustment threshold

5

%

What threshold are parties required to reach to qualify for adjustment seats?

Results

A	B
1	2
3	4
5	6



Vestur

4

3

8091

6718

2066

1796

1677

Settings

Divider for allocating constituency seats

Sainte-Laguë method

Adjustment method

Relative Superiority Method

Which divider rule should be used to allocate constituency seats to lists within each constituency?

Divider for apportioning adjustment seats

D'Hondt's method

Which method should be used to allocate adjustment seats?

Adjustment threshold

0

%

What threshold are parties required to reach to qualify for adjustment seats?

Which divider rule should be used to apportion adjustment seats among parties?

Divider for allocating adjustment seats

Sainte-Laguë method

Which divider rule should be used to allocate adjustment seats to individual lists?

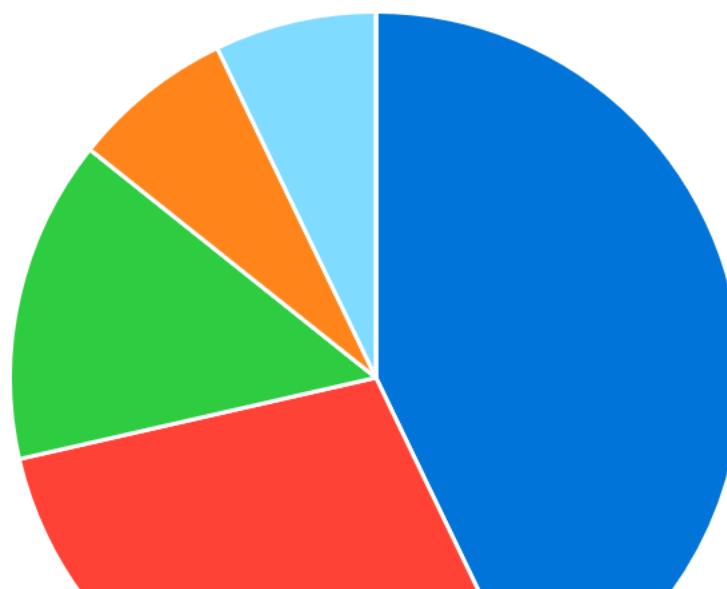
Results

A B C D E

Results

	A	B	C	D	E
Norður	3	2	1	1	0
Austur	4	2	1	0	0
Suður	2	2	1	1	1
Vestur	3	2	1	0	1
Total	12	8	4	2	2

■ A ■ B ■ C ■ D ■ E



**Vestur**

4

3

8091

6718

2066

1796

1677

Settings

Divider for allocating constituency seats

D'Hondt's method

Adjustment method

Switching Method

Which divider rule should be used to allocate constituency seats to lists within each constituency?

Divider for apportioning adjustment seats

D'Hondt's method

Which method should be used to allocate adjustment seats?

Adjustment threshold

5

%

What threshold are parties required to reach to qualify for adjustment seats?

Which divider rule should be used to apportion adjustment seats among parties?

Divider for allocating adjustment seats

D'Hondt's method

Which divider rule should be used to allocate adjustment seats to individual lists?

Results

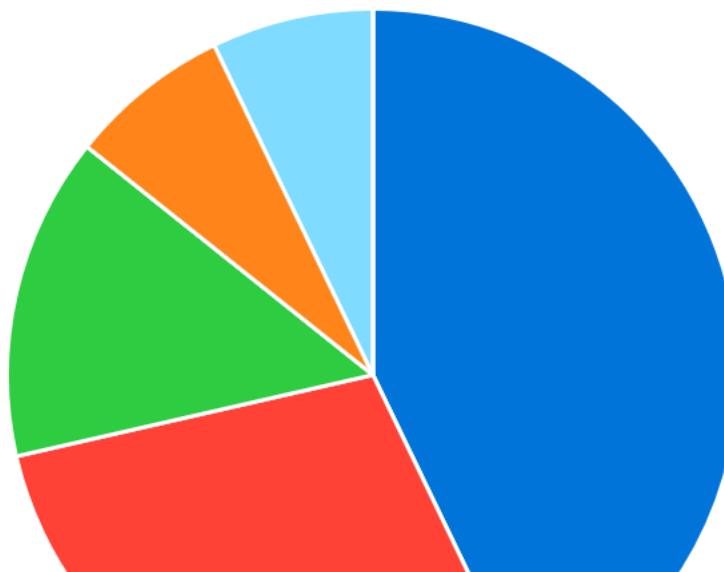
A**B****C****D****E**



Results

	A	B	C	D	E
Norður	3	2	1	1	0
Austur	4	2	1	0	0
Suður	2	2	1	1	1
Vestur	3	2	1	0	1
Total	12	8	4	2	2

■ A ■ B ■ C ■ D ■ E



[Voting](#) [Instructions](#) [Single Election](#) [Simulate](#)

Simulate elections

Settings

Simulation settings

Number of simulations

How many simulations should be run? (Minimum 2)

Generating method



Which method should be used to generate votes?

Simulate elections

Add election ruleset

Name

Delete this ruleset

Give this rule set a name.

Divider for allocating constituency seats

Adjustment method



Add election ruleset

Name

Atlantis RS

Delete this ruleset

Give this rule set a name.

Divider for allocating constituency seats

Sainte-Laguë method

Adjustment method

Relative Superiority Method

Which divider rule should be used to allocate constituency seats to lists within each constituency?

Divider for apportioning adjustment seats

D'Hondt's method

Which method should be used to allocate adjustment seats?

Adjustment threshold

0

%

What threshold are parties required to reach to qualify for adjustment seats?

Which divider rule should be used to apportion adjustment seats among parties?

Divider for allocating adjustment seats

Sainte-Laguë method

Which divider rule should be used to allocate adjustment seats to individual lists?



Name

Atlantis Switching

Delete this ruleset

Give this rule set a name.

Divider for allocating constituency seats

D'Hondt's method

Adjustment method

Switching Method

Which divider rule should be used to allocate constituency seats to lists within each constituency?

Divider for apportioning adjustment seats

D'Hondt's method

Which method should be used to allocate adjustment seats?

Adjustment threshold

5

%

What threshold are parties required to reach to qualify for adjustment seats?

Which divider rule should be used to apportion adjustment seats among parties?

Divider for allocating adjustment seats

D'Hondt's method

Which divider rule should be used to allocate adjustment seats to individual lists?

Reference votes

Reference votes are the votes that will be used as mean values for the statistical distribution in the simulation.

[Add constituency](#)[Add party](#)[Clear votes](#)[Reset everything](#)[Upload votes](#)[Paste input](#)[Load preset](#)[Save voteset](#)

	# Cons.	# Adj.	x	A	x	B	x	C	x	D	x	E
x Norður	4	3	6817	4548	2638	1889	956					
x Austur	4	3	8410	5739	3964	1139	859					
x Suður	4	3	4360	3118	2067	1183	1266					
x Vestur	4	3	8091	6718	2066	1796	1677					

[Start simulation](#)

0

Results

[Run simulation to get results](#)



	# Cons.	# Adj.	x	A	x	B	x	C	x	D	x	E
x Norður	4	3	6817	4548	2638	1889	956					
x Austur	4	3	8410	5739	3964	1139	859					
x Suður	4	3	4360	3118	2067	1183	1266					
x Vestur	4	3	8091	6718	2066	1796	1677					

Stop simulation

0.027146s/iter



Results

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Constituency seats

Atlantis RS										
A		B		C		D		E		
Average	Stddev	Average	Stddev	Average	Stddev	Average	Stddev	Average	Stddev	

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Constituency seats

Atlantis RS

	A		B		C		D		E	
	Average	Stddev								
Norður	1.82	0.40	1.03	0.17	0.86	0.35	0.27	0.45	0.01	0.12
Austur	1.98	0.14	1.01	0.10	1.00	0.04	0.01	0.10	0.00	0.04
Suður	1.55	0.50	1.02	0.14	0.95	0.21	0.21	0.41	0.27	0.44
Vestur	1.88	0.34	1.47	0.50	0.35	0.48	0.17	0.38	0.13	0.34
Total	7.23	0.76	4.53	0.56	3.16	0.64	0.67	0.71	0.42	0.57

Atlantis Switching

	A		B		C		D		E	
	Average	Stddev								
Norður	2.17	0.41	1.21	0.40	0.54	0.50	0.08	0.27	0.00	0.04
Austur	2.03	0.23	1.08	0.28	0.88	0.32	0.00	0.00	0.00	0.00
Suður	1.98	0.30	1.15	0.36	0.78	0.42	0.03	0.17	0.06	0.24
Vestur	2.09	0.31	1.81	0.39	0.06	0.24	0.02	0.13	0.02	0.13
Total	8.27	0.64	5.25	0.72	2.26	0.76	0.13	0.35	0.08	0.28

Adjustment seats



Adjustment seats

Atlantis RS

	A		B		C		D		E	
	Average	Stddev								
Norður	1.15	0.49	0.93	0.35	0.20	0.40	0.57	0.50	0.15	0.36
Austur	1.32	0.52	1.14	0.42	0.33	0.47	0.14	0.35	0.06	0.23
Suður	1.00	0.58	0.87	0.38	0.11	0.31	0.44	0.50	0.58	0.49
Vestur	0.99	0.50	0.85	0.51	0.47	0.50	0.30	0.46	0.39	0.49
Total	4.47	0.84	3.80	0.65	1.10	0.65	1.45	0.62	1.18	0.60

Atlantis Switching

	A		B		C		D		E	
	Average	Stddev								
Norður	0.83	0.52	0.71	0.47	0.54	0.50	0.78	0.45	0.14	0.35
Austur	1.24	0.53	1.00	0.45	0.60	0.50	0.12	0.32	0.04	0.21
Suður	0.54	0.51	0.69	0.49	0.39	0.49	0.61	0.49	0.77	0.48
Vestur	0.83	0.54	0.69	0.53	0.47	0.50	0.49	0.50	0.53	0.52
Total	3.44	0.71	3.09	0.71	2.01	0.66	1.99	0.46	1.48	0.59

Total seats

Total	3.44	0.71	3.09	0.71	2.01	0.66	1.99	0.46	1.48	0.59
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Total seats

Atlantis RS

	A		B		C		D		E	
	Average	Stddev								
Norður	2.97	0.41	1.96	0.35	1.06	0.26	0.84	0.37	0.17	0.37
Austur	3.30	0.53	2.15	0.43	1.33	0.47	0.15	0.36	0.06	0.24
Suður	2.55	0.51	1.89	0.41	1.06	0.24	0.65	0.48	0.85	0.37
Vestur	2.87	0.51	2.32	0.48	0.82	0.40	0.47	0.50	0.52	0.50
Total	11.70	0.72	8.33	0.65	4.26	0.59	2.12	0.45	1.60	0.52

Atlantis Switching

	A		B		C		D		E	
	Average	Stddev								
Norður	3.00	0.50	1.92	0.43	1.08	0.38	0.86	0.43	0.14	0.35
Austur	3.27	0.54	2.08	0.42	1.49	0.50	0.12	0.32	0.04	0.21
Suður	2.52	0.52	1.84	0.47	1.17	0.41	0.64	0.49	0.83	0.47
Vestur	2.92	0.57	2.50	0.56	0.53	0.51	0.50	0.52	0.55	0.53
Total	11.71	0.73	8.34	0.66	4.27	0.60	2.12	0.46	1.56	0.58



Quality measures

Adjustment method	Atlantis RS		Atlantis Switching	
	relative-superiority		switching	
	Average	Std. deviation	Average	Std. deviation
Deviation in number of seats allocated by the tested method versus:				
Allocation by the optimal method	0.5120	1.5332	1.5760	2.3305
Allocation by Icelandic Law	3.4160	2.6277	2.8880	2.6460
Adjustment seats apportioned nationally	0.0000	0.0000	0.0000	0.0000
Allocation as if all seats were constituency seats	3.0560	1.6475	4.4960	1.5795
Allocation as if all seats were adjustment seats	0.0040	0.0894	0.0000	0.0000
Quality indices (generally 0 to 1, the lower the better):				
Relative entropy deviation from optimal solution	0.0051	0.0207	0.0351	0.0691
Proportionality index according to Loosmore-Hanby (adjusted to biproportionality)	0.2157	0.0232	0.2246	0.0321
Scaled sum of squared deviation of list seats from biproportional seat shares (Sainte-Lague)	0.1097	0.0254	0.1204	0.0320
Maximum of the minimum seat value used (d'Hondt)	0.4593	0.0884	0.4664	0.0935
Scaled sum of positive deviation of list seats from biproportional seat shares (d'Hondt)	0.1708	0.0231	0.1837	0.0300

Framhaldið, fróðleikur og umræða

Smári McCarthy o.fl.

Hvað nú?

- Hugbúnaðurinn verður gerður aðgengilegur von bráðar með einhverju móti
- Tillögur, hugmyndir og vinnuframlag til endurbóta og viðbóta er vel þegið
- Viðræður við fundargesti

Tenglar

- Netföng aðstandenda
 - Martha Guðrún Bjarnadóttir, marthagudrun6@gmail.com
 - Pétur Ólafur Aðalgeirsson, peturoa1@gmail.com
 - Smári McCarthy, smarim@althingi.is
 - Þorkell Helgason, thorkellhelga@gmail.com
- Aðgengi að hugbúnaðinum (til bráðbirgða)
 - <http://voting.smarimccarthy.is/#/simulate>

Viðbótarefni (drög)

- Á vefsíðu landskjörstjórnar eru úrslit og greiningar á alþingiskosningum 2003-2013, t.d. sú fyrsta:
<https://landskjor.is/media/frettir/Greining2003endurbaett2013.pdf>
- http://www.aardal.info/celius-zigne/http://www.aardal.info/celius-zigne/ í fórum Þorkels Helgasonar er ýmislegt að finna um viðfangsefnið
 - Vefsíða hans: thorkellhelga@gmail.com
 - Grein í mbl.is 10. september 2018:
https://www.mbl.is/frettir/innlent/2018/09/10/hin_fullkomna_adferd_er_of_flokin/
 - Grein í Stjórnmál og stjórnsýsla:
<http://www.irpa.is/article/view/b.2014.10.2.3>
- Norðmaður með svipað, en þó ekki hermun
 - <http://www.aardal.info/celius-zigne/>
- Afar fróðleg síða
 - <https://kosningasaga.wordpress.com/>