A language for robots and humans alike

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Background

Otomitso is a language designed for a (possibly not so futuristic) society in which humans and robots live in some semblance of harmony. There were three primary design goals for the development of this language:

- All sounds must be distinctly human (as a caveat, I'm not building an auxlang, nor am I fighting an inherent English bias)
- The grammar should be easily parseable by humans and computers
- The writing system should be simplistic, easy to read, and easy for a robot less dextrous than a human to write

Phonology

Motivation & Context: When choosing sounds, my goal was to make all sounds as distinct as possible to make it easier for computers (and humans!) to determine what was said. For example, I excluded /bl/ from the complex onsets because it sounds very similar to /pl/. Likewise, /k/ and /g/ sound similar, so I put them in free variance.

Inventories

i		u
e		o
	a	
Dipthongs:		ai

	Labial	**Labiodental**	**Alveolar**	**Velar**
Nasal	m		n	
Stop	p b		t d	k g
Fricative		f	s	
Lateral			l	

Syllable Structure

Otomitso uses a (C)(C)V(C)(C) syllable structure. If there is only one consonant in the coda and/or onset then it can be any consonant.

Complex Onsets	/fl/	/sl/	/pl/	/kl/
Complex Codas	/st/	/nd/	/*s/	(where * is any consonant)

The stress rule for the language is simple: Always stress the first syllable.

Grammar

Motivation & Context: Otomitso's grammar is a very simple context-free grammar. Specifically, the grammar is *equivalent* to a grammar in Greibach normal form. I say equivalent because I make one exception in notation: I write some rules as `A -> A1 A2 A3` rather than `A -> a A2 A3` which isn't strictly allowed in Greibach Normal form. However, by simply expanding `A1` into each of its rules (possibly recursively) I could write the grammar such that it would be in Greibach normal form it would just result in a much larger grammar. The advantage of having the grammar in this strict form is that it means a parser (e.g. a robot) can parse a sentence from left-to-right only looking at one word at a time. In other words, as a speaker speaks a sentence, the computer can parse it in "real time".

Sentence	`S′`	→	`lilo S′`	True/false questions
	`S′`	→	`S`	
	`S`	→	`<conj> S S`	Compound sentences
	`S`	→	`1VP NP`	V S
	`S`	→	`2VP NP NP`	V S DO
	`S`	→	`NP`	As a question response, usually
	`S`	→	`VP`	As a question response, usually
Verb Phrases	`1VP`	→	`ost 1VP`	Negation of a verb
	`1VP`	→	`<one-verb>`	
	`1VP`	→	`<adverb> 1VP`	
	`1VP`	→	`<prep> NP 1VP`	
	`1VP`	→	`1VL`	
	`2VP`	→	`ost 2VP`	Negation of a verb
	`2VP`	→	`<two-verb>`	
	`2VP`	→	`<adverb> 2VP`	

	2VP → <prep> NP 2VP		
	2VP → 2VL		
Noun Phrases	NP → plai[1] S		Nested clauses/sentences
	NP → <noun>		
	NP → <article> NP		
	NP → <prep> NP NP		
	NP → ut[2] NP NP		Possession
	NP → NL		
	NP → VP		
Lists	LE → ul		End of a list
	1VL → <list>[3] 1VLI LE		List of verbs
	1VLI → la 1VP 1VLI		
	1VLI → la 1VP		
	2VL → <list> 2VLI LE		List of verbs that are the “same”
	2VLI → la 2VP 1VLI		
	2VLI → la 2VP		
	NL → <list> NLI LE		List of nouns that are the “same”
	NLI → la NP NLI		
	NLI → la NP		

[1] Admittedly, plai is sort of my “magic” word. It’s often used, somewhat awkwardly, to accomplish the task of an infinitive in English. So in English where you’d say “I want to eat” you’d say “I want that I am eating” in otomitso.”

[2] ut A B is the same as A’s B in English

[3] See “List Types” in the Vocabulary section

Morphology

Adverbification

Both nouns and adjectives can be transformed into adverbs by prepending /a/ if the word begins with a consonant and /an/ if it begins with a vowel. The literal translation of this is more clear with adjectives than it is for verbs.

Examples

- `kolen` (happy) becomes `akolen` (happily)
- `oto` (robot) becomes `anoto` (robotically, in a robot like way)

Nounification

Verbs can be transformed into nouns in the following ways:

- Append /i/ or /si/ to a verb that ends in a consonant or vowel, respectively, to turn it into a word meaning “a biological entity that does that verb”
- Append /o/ or /so/ to a verb that ends in a consonant or vowel, respectively, to turn it into a word meaning “a robot that does that verb”

Examples

- `telse` (compute/think) becomes `telseso` (robot computer)
- `bust` (work) becomes `busti` (human worker)

Adjectives can be changed into nouns by appending /and/ or /nd/ to a verb that ends in a consonant or vowel, respectively, to turn it into the “metric” used to measure a particular verb.

Examples

- `nelok` (hunappy) becomes `nelokand` (unhappiness)
- `lusfuno` (different) becomes `lusfunond` (differences)

Pluralization

Append /est/ to a noun to make it plural, regardless of how it ends.

Examples

- `mimitso` (child) becomes `mimitsoest` (children)

Verb Number

Verbs implicitly have a certain number of arguments they expect. Verbs can either expect both a subject and an object, or just a subject. Any verb that expects a subject and an object can be modified to accept just a subject, but not every verb that accepts a subject can be modified to accept an object. By default, a verb accepts only a subject. These are the versions given in the vocabulary later in this document. If a verb can be modified to accept an object, append /a/ or /ta/ if the verb ends with a consonant or vowel, respectively.

Examples

- `klafa` (to eat, generic) becomes `klafata` (to eat, something specific)

Inability

To modify a verb to become an adjective meaning “to be able to perform that verb on/to something” prepend /ako/. To mean the opposite (inability) prepend /aki/.

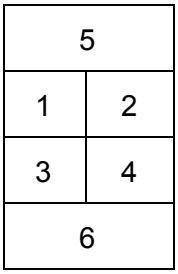
Examples

- `telse` (to think/compute) becomes `akitelse` (uncomputable/unthinkable)

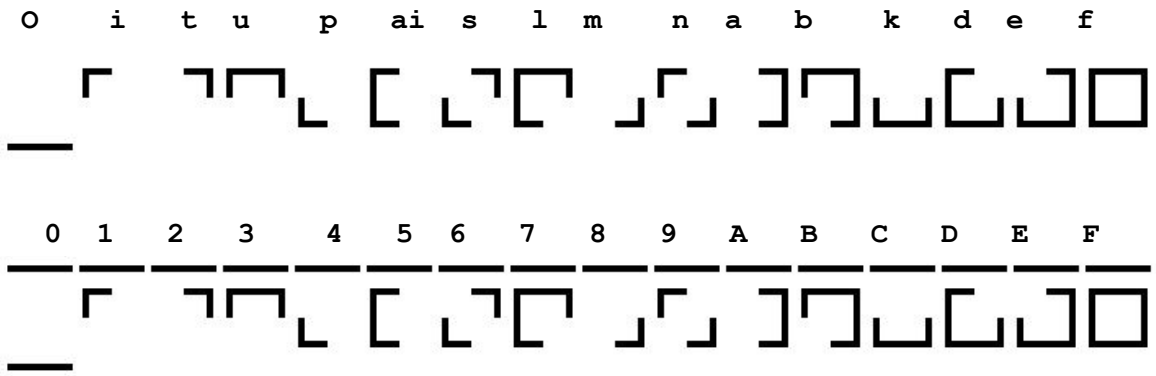
Writing System

Motivation & Context: As mentioned in the beginning, the writing system for Otomitso needed to be simple for a computer to read (with computer vision for example) and also easy to write with manipulators less dextrous than human hands. A simple grid satisfied both of these constraints and also lead to a natural internal representation for the computers (8-cell binary grids become 8-bit bytes)

The graphemes in the Otomitso alphabet are based on a grid:



The numbers in each cell identify the corresponding bit in the byte that the computer would use to represent each grapheme internally when translating a written sentence to some logical representation. There are 32 distinct graphemes, 16 letters and 16 numerals:



Text is written from left-to-right starting at the top and moving down.

Lexicon

Pronouns

i	I, human
o	I, robot
ti	you, human
to	you, robot
fi	he/him/she/her, human
fo	he/him/she/her, robot
est	we, human
test	you all/yinz/y'all
fest	them/they

Common Nouns

oto	robot
mitso	human
mimitso	child

liba	sibling
tiba	partner/spouse
itso	animal
mataba	head/brain
dibe	eye/vision sensor
lote	ear/audio sensor
fise	arm/leg/manipulator
kip	hand/foot/end-effector
memso	file
klabo	robot food
klabi	human food
amabi	meat/flesh of a bio
tamfat	planet
dols	part/region/area
amep	ship/vehicle
migoi	radio
slai	signal
tos	light
fatos	star
plas	water
slip	idleness/inaction
koda	command/order
bitsi	law
askani	protection
abast	existence
poka	thought/idea

asu	race (as in “the human race”)

Adjectives

ile	female
ilu	male
fatsa	of the sky
mata	of the ground
plasa	of the water
tamba	of the underground
kolen	happy
nelok	unhappy
lusfuno	different
sokna	stealth/spy/quiet
pata	quick
ulita	tall
siti	pleasing
ikati	injured
kalumbo	ridiculous/silly
oso	only/sole
otsomi	sentient/conscious/intelligent

Adverbs

labo	before/past
laba	presently
labi	after/future
puffam	completely/to the fullest extent

Prepositions

gub	from
nok	of
omu	onto
mu	to
dai	By-way-of (like via in English)
imu	in/inside/within

Verbs

aba	to be/to exist
aiko	output/tell/say
okai	input/hear/listen
aikokai	communicate/talk/converse
telse	think/compute
klafa	eat
klaba	drink
bust	work
kuko	make
kukam	to be made of/composed of
tosed	pick up
edpan	bring/take with
mokmeb	probe/investigate
okuki	to be certain
pep	use
kati	injure

oluna	allow
ekse	follow/obey
lolo	contradict
skan	protect
mali	want
fliti	try
kiri	ask
puta	believe

Conjunctions

in	and
on	but
untu	unless

Articles[4]

geest	some/many/several

Numerals

0	lo
1	li
2	ta
3	tu
4	fe
5	kai

[4] Articles are used *very* sparingly in Otomitso. Typically, the meaning is implied pretty clearly. If not, you should used adjectives or something to clarify what specifically you're talking about.

6	sa
7	se
8	ku
9	me
A	ma
B	bu
C	ka
D	da
E	et
F	fu

List Types

le	List of things that are the same
olu	List of different things, at least one of which is relevant (in English: a, b, or c)
alu	List of different things, all of which are relevant (in English: a, b, and c)

Misc

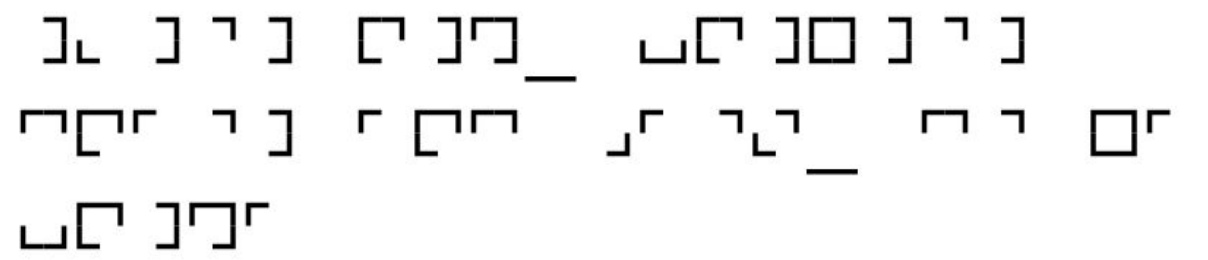
ut	Possession
usu	Can be used once anywhere in a sentence to indicate a request for a value (as in Who? What? When?)
ost	Negation, can be used in front of a verb to say that something didn't occur

Examples & Transcriptions

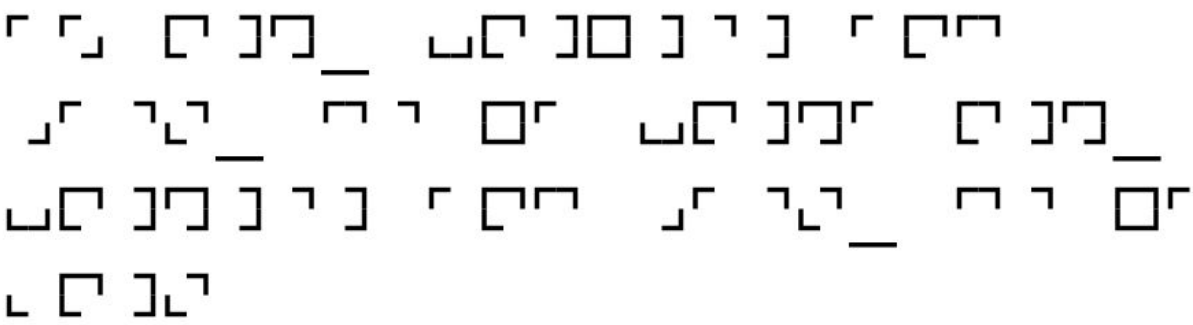
In this section we'll look at some sample sentences/passages of increasing complexity, to illustrate some of the language features in practice.

Simple sentences

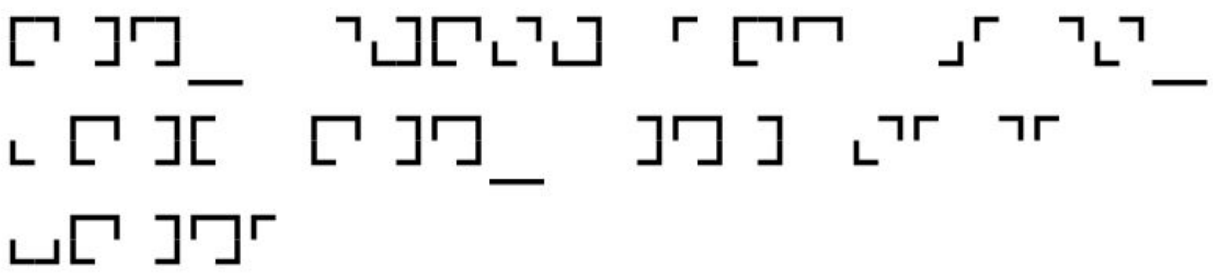
Klafata ilu mitso klabi
eating-SO-PRES male human food
The man is eating food



apata labo klafata ulita ilu mitso ut fi klabi
Quickly in the past eat-SO tall male human belonging to him food
The tall man quickly ate his food



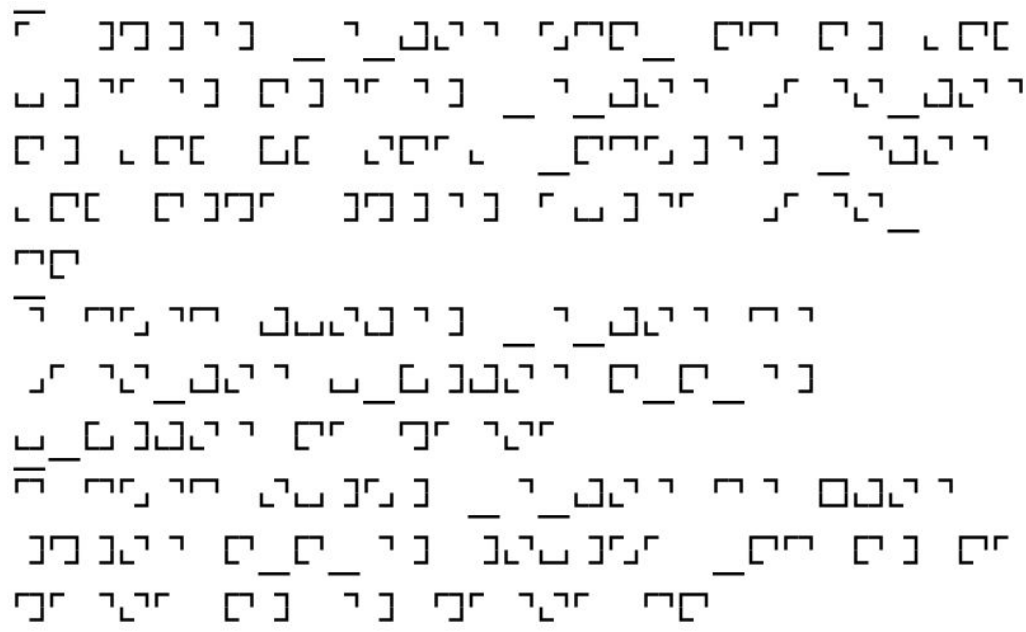
In labo klafata ilu mitso ut fi klabi
And in the past eat-SO male human belonging to him food
labo klabata ilu mitso ut fi plas
In the past drink-SO male human belonging to him water
The man ate his food and drank his water



Labo telse ilu mitso plai labo aba siti klabi
In the past think male human CLAUSE in the past to be pleasing food
The man thought the food tasted good

Isaac Asimov's "Three Laws of Robotics"[5]

1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
2. A robot must obey orders given it by human beings except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.



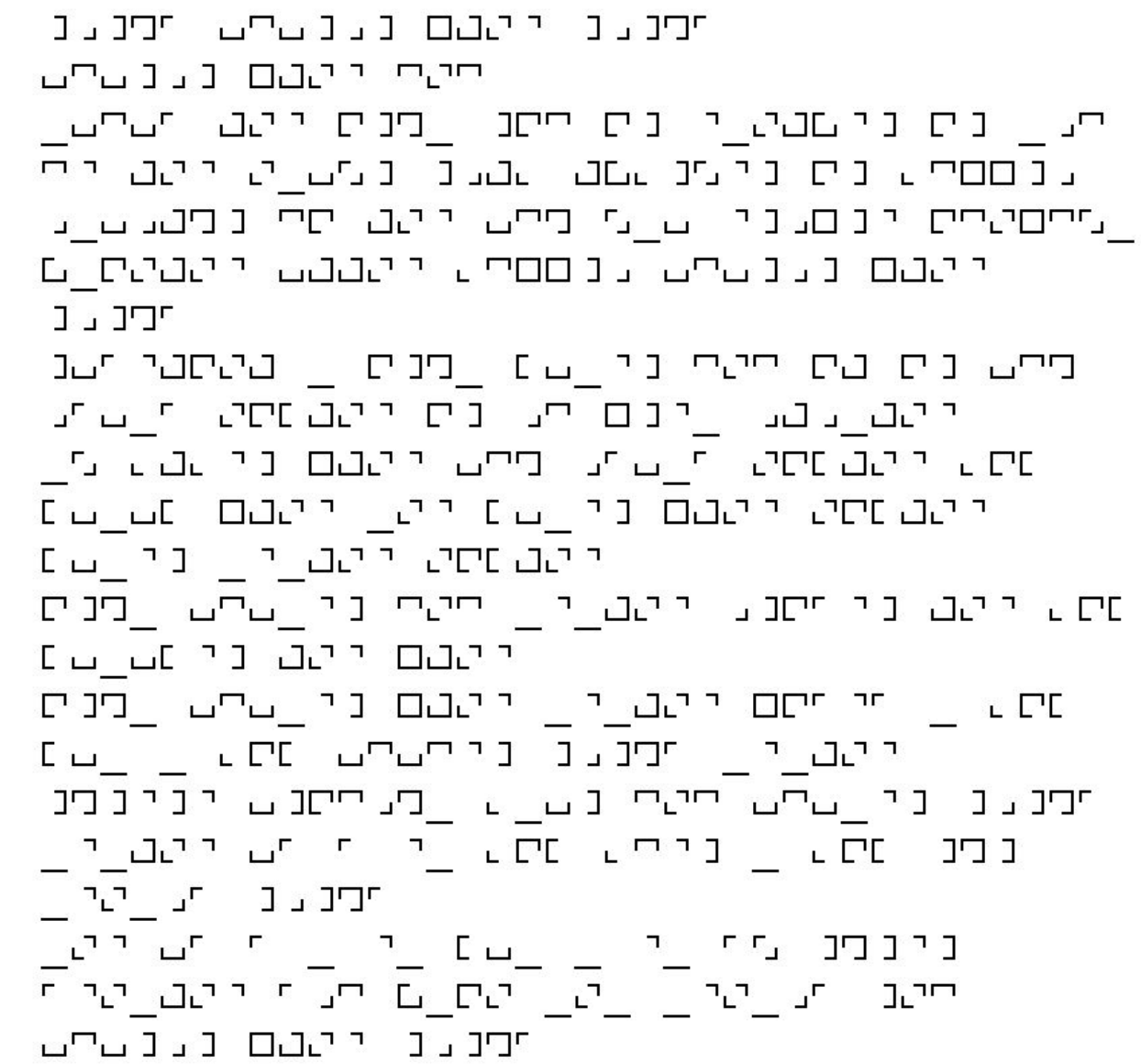
1. **Abata otoest nulo lu la plai katita**
   To-be-SO robots forbidden list-different list-item CLAUSE
   latita otoest mitsoest la plai dai slip
   Injure-SO robots humans list-item CLAUSE by-way-of idleness
   olunata otoest plai labi abata ikati mitso ul
   allow-SO robots CLAUSE future to-be-SO injured humans list-end
2. **Untu ekseta otoest ut mitsoest kodaest**
   Unless obey-SO robots belonging to humans commands
   lolota kodaest li bitsi
   contradict-SO orders first law
3. **Untu skana otoest ut fest abast**
   Unless protect-SO robots belonging to the m existence
   lolota askani olu la li bitsi
   contradict-SO protection list-or list-ite m first law

[5] These laws were the focus of much debate during the Robot Rights Movement of 3035.

```
la          ta      bitsi ul
list-item Second law list-end
```

They’re Made of Meat by Terry Bisson

A: "Meat. They're made out of meat."
B: "Meat?"
A: "There's no doubt about it. We picked up several from different parts of the planet, took them aboard our recon vessels, and probed them all the way through. They're completely meat."
B: That's impossible. What about the radio signals? The messages to the stars.
A: They use the radio waves to talk, but the signals don't come from them. The signals come from machines.
B: So who made the machines? That's who we want to contact.
A: They made the machines. That's what I'm trying to tell you. Meat made the machines.
B: That's ridiculous. How can meat make a machine? You're asking me to believe in sentient meat.
A: I'm not asking you, I'm telling you. These creatures are the only sentient race in that sector and they're made out of meat.



A: Amabi. Gugama fest amabi.

A: Meat. To be made of they meat

B: Gugama fest usu?

B: To be made of they what?

A: Okuki est. labo alu la tosedta

To-be-certain we in the past list-and list-item pick up-SO

la omu ut est sokna amep edpanta la

list-item onto belonging to we spy ship bring-SO list-item

puffam mogmeba ul est gub nok tamfat lusfuno dolsest

completely probe list-end we from of planet different regions

geest Puffam gugama fest amabi.

Several. Completely to be made of they meat.

B: akitelse o labo aikota usu le

Unable-to-compute me. in-the-past to-output-SO who? list-same

la gub migoi slaiest la mu fato memoest

list-item from radio signals list-item to stars filest/data

A: On pepta fest gub migoi slaiest plai aikokai fest ost

But use-SO them from radio signals CLAUSE communicate them NEG

aikota fest slaiest. Aikota otoest slaiest.

output-SO Them signals. Output-SO robots signals

B: labo kukota usu otoest. Malita est plai aikokaita est

In the past make-SO who? Robots Want we CLAUSE communicate we

fest

them

A: labo kukota fest otoest. Fliti o plai aiko o plai

In-the-past make-SO they robots try I CLAUSE output me CLAUSE

kukuta amabi otoest

make-SO meat robots

B: abata kalumbo poga. Usu kukota amabi otoest. Kiri to

to-be-SO ridiculous idea how? Make meat robots ask you

plai puta o plai aba otsomi amabi

CLAUSE believe me CLAUSE to-be sentient meat

A: ost kiri o to aiko o to. In abata itsoest imu dols oso

NEG ask me you tell me you. And to-be-SO animals in region only

otsomi asu gugama fest amabi

sentient race made-of they meat