ReadMe for Virtual State Trial Edition

'Virtual State.binary' enables you to instantly implement the virtual state model in diverse settings on the platform of *artisoc* version 1.0 or later. For more specific details on *artisoc*, please visit Kozo Keikaku Engineering (KKE)'s web site (http://mas.kke.co.jp/, in Japanese). The model described here is compatible with any system that can operate *artisoc*.

GETTING STARTED

Open 'Virtual State. binary' in *artisoc*. For starting a simulation run, click the **Play** button under the menu bar. A simulation ends automatically after a specified number of time periods. Alternatively, you can forcibly end a run by clicking the **Stop** button.

CONTROL PANEL

The Control Panel gives you instant access to various parameters that condition a simulation run, including the following.

・**Country**: which specifies the virtual state in which a simulation is conducted. Enter any one of the following options in the text box: **ETH** (Ethiopia before the Eritrean independence); **FDRE** (Federal Democratic Republic of Ethiopia. That is, Ethiopia after the Eritrean independence); **KEN** (Kenya); **NSDN** (North Sudan); **SOM** (Somalia); **SDN** (Sudan); or **SSDN** (South Sudan).
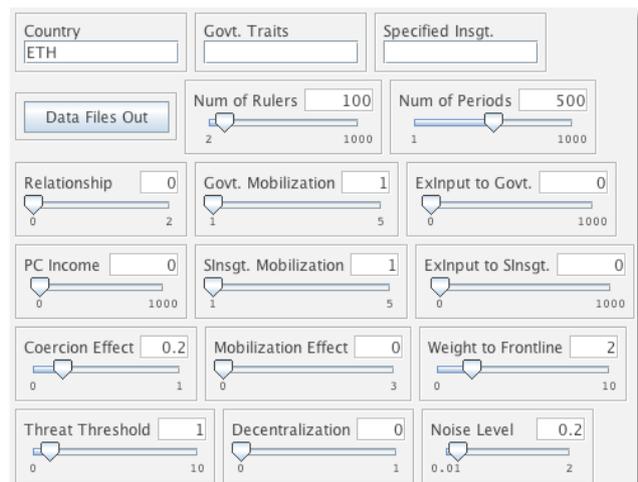
・**Govt. Traits**: which specifies the *Traits* of the *Initial Government*. The blank indicates the predetermined *Initial Government* in each virtual state (such as the government with *Traits* ("01","01","01") in virtual Sudan). Other values can be

assigned by directly filling in the text box, such as in the manner '**,**,02', which is in order of "ethnicity", "religion", "region".   In the present version of the model, a trait in each category should be represented in the form of two-digit strings, with the exception of virtual Somalia, in which case a trait in the ethnicity category should be represented by a six-digit string with the additional specification regarding subclass.

· **Specified Insgt.**: which introduces a 'customized' insurgent *Ruler* to a specific virtual state.   The *Traits* and place of infiltration of the insurgent *Ruler* are described in a separate text file, which is located in the relevant country folder under the Input folder.   For activating this function, enter the name of the file (without an extension) in the text box.   The customized *Ruler*'s *Mobilization Level* and *External Resources* can be manipulated through the **SInsgt. Mobilization** and **ExInput to SInsgt.** slide bars in the Control Panel. Currently, the following two scenarios are provided: **SPLA** in virtual Sudan and **WSLF** in virtual Ethiopia-Eritrea.   The former puts an ethnically, religiously and regionally neutral insurgent *Ruler* in the southern part of virtual Sudan, while the latter infiltrates an ethnically and religiously inclined *Ruler* into the southeastern part of virtual Ethiopia-Eritrea.

· **Data Files Out**: which specifies whether or not various simulation outputs are to be recorded in separate text files.   These files are created in the corresponding country folder under the Output folder.

· **Num of Rulers**: which specifies the number of *Ruler* agents including the *Initial Government*.

· **Num of Periods**: which specifies the number of time periods during which a simulation is run.

· **Relationship**: which controls mutual relationships among *Ruler* agents.   "0" denotes relationships that are purely competitive by default; "1" allows tactical alignments amongst Rulers; and "2" introduces a two-level institutional arrangement to the Initial Government, under which a certain degree of autonomy is ceded to regional governments.   The alignment in the case of **Relationship**=1 is automatically formed amongst *Ruler*s that share a 'prime threat'; that is, the adjacent *Ruler* that deploys the largest amount of resources in their neighborhood.   **Threat Threshold** in the Panel sets a limit on the range

of *Ruler*s that can become a *Ruler*'s 'prime threat' in terms of the ratio of the former's resources to the latter's. On the other hand, the administrative boundaries of regional governments in the case of **Relationship**= 2 are exogenously given in each virtual state. The **Decentralization** slide bar manipulates the relationship between the central and the regional governments.

・ **Govt. Mobilization**: which specifies the *Mobilization Level* of the *Initial Government*.

・ **ExInput to Govt.**: which specifies the *External Resources* of the *Initial Government*.

・ **PC Income**: which specifies the annual GNI per capita (US$) of the virtual state concerned. Moving the slider to 0 sets the empirically based default value to this variable.

・ **Coercion Effect**: which controls the relative impact of military interactions against political interactions, in the determination of *PopCell*s' *State* variables.

・ **Mobilization Effect**: which specifies the extent by which a unit of increase in the *Mobilization Level* of a *Ruler* causes the probability of a *PopCell* being under the rule of the *Ruler* in question to decrease. In other words, **Mobilization Effect** controls how sensitive inhabitants on *PopCell*s are, to the burden of *Ruler*s' mobilization.

・ **Weight to Frontline**: which controls the extent by which a *Ruler*'s allocation of mobilized resources to a *PopCell* depends on whether or not the latter adjoins another *Ruler*'s territory.

・ **Noise Level**: which specifies the amount of stochastic noise that causes contingent state transitions of *PopCell*s.

RULERCONFIG WINDOW

This window displays the current macro-state of territorial integration and disintegration of the virtual state concerned.
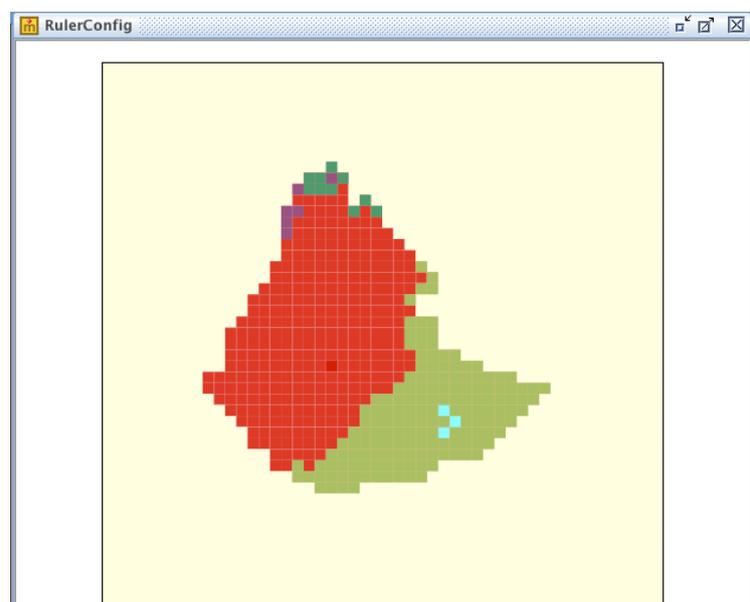
Differences in *PopCell*s' colors indicate differences in the *Ruler*s to which they belong. In particular, *PopCell*s colored red are those that are ruled by the *Initial Government*. The *PopCell* where the capital is located, is colored dark red. In the case that a customized insurgent *Ruler* is present in the virtual state, the insurgent *Ruler*'s territory is indicated by the color blue.

OUTPUT WINDOW
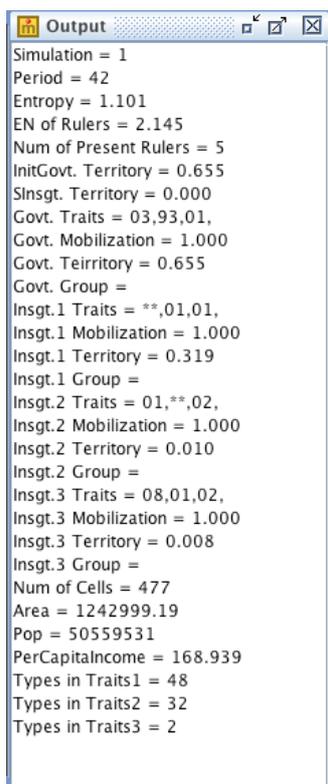

```
Output
Simulation = 1
Period = 42
Entropy = 1.101
EN of Rulers = 2.145
Num of Present Rulers = 5
InitGovt. Territory = 0.655
SInsgt. Territory = 0.000
Govt. Traits = 03,93,01,
Govt. Mobilization = 1.000
Govt. Teirritory = 0.655
Govt. Group =
Insgt.1 Traits = **,01,01,
Insgt.1 Mobilization = 1.000
Insgt.1 Territory = 0.319
Insgt.1 Group =
Insgt.2 Traits = 01,**,02,
Insgt.2 Mobilization = 1.000
Insgt.2 Territory = 0.010
Insgt.2 Group =
Insgt.3 Traits = 08,01,02,
Insgt.3 Mobilization = 1.000
Insgt.3 Territory = 0.008
Insgt.3 Group =
Num of Cells = 477
Area = 1242999.19
Pop = 50559531
PerCapitaIncome = 168.939
Types in Traits1 = 48
Types in Traits2 = 32
Types in Traits3 = 2
```

This window displays various macro and micro indices that monitor the constantly changing conditions of a virtual state, including:

・ **Entropy** (*Disintegration Index, DI*): which quantifies the degree of territorial disintegration in a virtual state with a non-negative number. Its value increases as territorial rule becomes more fragmented.

・ **EN of Rulers**: which displays the effective number of *Ruler*s existing on the territory. This is calculated based on **Entropy**.

・ **Num of Present Rulers**: which displays the simple number of *Ruler*s existing on the territory.

・ **InitGovt. Territory**: which shows the proportion of the total area of the *Initial Government*'s territory, relative to the whole territory.

・ **SInsgt. Territory**: which shows the proportion of the total area of the specified insurgent *Ruler*'s territory, relative to the whole territory.

・ Information on the current government (**Govt. Traits/Govt. Mobilization/Govt. Territory/Govt. Group**): which displays the *Traits* and the *Mobilization Level* of the *Ruler* that holds the capital in a given period of time, along with the proportion of its territory and the ID of the alliance to which it belongs.

・ Information on insurgent *Ruler*s: which displays the *Traits*; the *Mobilization Levels*; the proportion of the territories; and the alliance groups of the top three

insurgent *Ruler*s.

- Other information on the virtual state: which shows the total number of *PopCell*s; the total population; the total area; the GNI per capita; and the number of socio-cultural traits in each category.