

Refugees: Searching for Security, Searching for Hope

Qingqing Ren

School of North China Electric Power University, BaoDing 471000,China

1051281947@qq.com

Keywords: Dynamic Process Optimal Refugees Routes Grey Relational Analysis

Abstract. In order to propose the optimal route for each refugee^[1], we have finished the following work. Firstly, Grey Relational Analysis model is established to analyze the correlation coefficient of a plurality of metrics. The indicators with larger correlation coefficient are chosen as the metrics. In our model, the route is the most important metrics that has the largest correlation coefficient, and its correlation coefficient is 0.7876. Then, Analytic Hierarchy Process is applied to establish the optimal refugee route model. We create the judgment matrix according to the specific situation of each refugee. As a result, the optimal route for each refugee is determined.

1. Introduction

Recently, the European refugee crisis continues to simmer. A large number of refugees board Europe, causing serious impact on European political, economic and security fields. The influx of refugees with a large scale shows the characteristics of the geometric level of digital growth. At the same time, the humanitarian crisis occurred frequently. Mediterranean this year has swallowed nearly 3000 lives, 71 refugee bodies hidden in the corpse van on the Austrian border shocked us and Syria 3-year-old boy drowned beach photos touched people's heart. The continuous growth of the number of refugees and the high mortality rate seriously remind people of the significance of the development of a reasonable policy.

2. The Optimal Refugee Route Model

2.1 Terminology and Definitions

Symbol	Definition
x_{ij}	The situation of refugee j about factor i
ξ_{0i}	The correlation coefficient of reference factor i
ρ	Resolution factor
r_i	The correlation degree of reference factor i
W	Criteria of judgment
R_{ij}	The important degree of index j relative to the index i
CR	Consistency ratio
CI	Consistency index
D_k	Weight of the k destination

Before analyzing the presented models, we make some reasonable assumptions as follows:

- Usually, The EU will only be taken into account
- Assume that there is no mortality after refugees arrive EU
- Assume that non-governmental organizations will provide assistance to the refugees unconditionally.

2.2 Specific Route of Refugee Migration

we summarize the major six refugee migration routes. They are shown in Fig. 1:

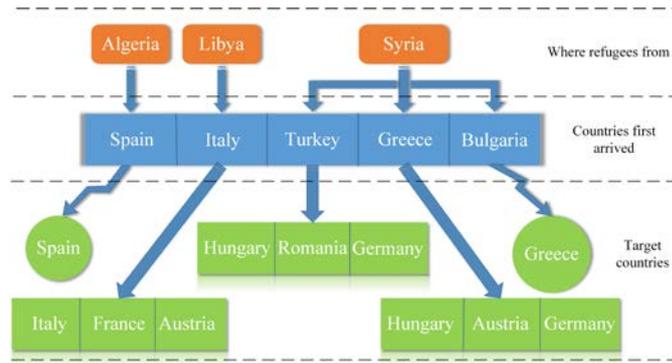


Fig. 1: The specific travelling routes of refugees

The target countries are the countries that have accepted refugees most in recent years, and the countries that refugees set off from are places that produced refugees most.

The model starts from the perspective of refugee. It is a very complicated process that a refugee decide where to seek asylum, which we need to consider including geography, the characteristics of individuals, the nearby national political considerations, and other factors. Therefore, for so many aspects of these model, we have to make specific classification: age, family member, personal property, language, route, transportation, refugee standard, number of entrance, refugee resource.

2.3 Hierarchy of the Model

To determine the best destination for a refugee after considering various factors, we deem that the target layer is to choose a destination, the criterion layer is metrics mentioned above, and the program layer is the optional destinations^[2]. Then we build the structure model, as shown in Fig. 2.

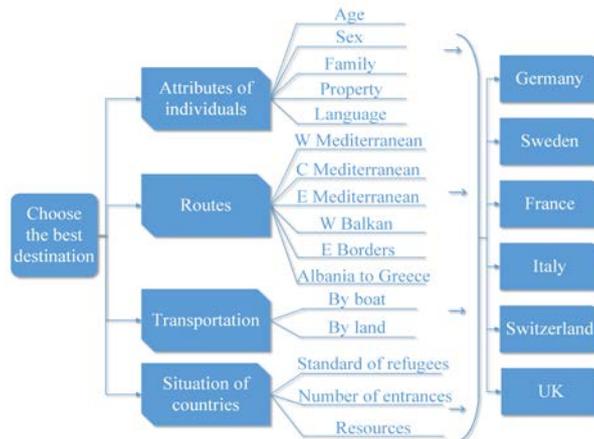


Fig. 2: Hierarchy of the Model

2.3.1 The Overall Ranking of the Target Hierarchy

What needs to be done first is to calculate weight for metrics in criterion layer. By analyzing the importance between each metrics, we build the judgment matrices. The judging standard is shown in Tab. 1.

Tab. 1: Judgment standard

W	1	3	5	7	9	2,4,6,8
R_{ij}	Equally important	Slightly important	Obviously important	Strongly important	Absolutely important	Importance lies between the grades

In which, W represents each level, R_{ij} is the important degree of the index i to the index j and $R_{ij}=1/R_{ji}$.

Factors were compared to obtain the judgment matrix of each criterion, then the maximum eigenvalue of the matrix is the weight of each criterion in the target.

And then check the consistency of the judgment matrix. According to the formula:

$$CI = (\lambda_{\max} - n) / (n - 1)$$

$$CR = CI / RI$$

CR is the consistency ratio, When CR is less than or equal to 0.1, it means the consistency of judgment matrix is satisfied, Otherwise, it should be re adjusted.

Next, the weight vector of each element of criterion layer two is calculated. Similarly, the judgment matrix is constructed and the consistency check is carried out. Then the weight vector of the elements of each scheme can be obtained.

Then, the weight vector of each scheme is calculated for each element of the criteria two. Similarly, the judgment matrix is constructed and the consistency check is carried out. Then the weight vector of the elements of each scheme are obtained as $W_k (k=1,2,\dots,6)$.

Finally, the total order of each scheme is calculated. We take the weight vector of each plan to the target as hierarchical total ranking, Remembering as D_k . The weight vector of the criterion layer two on the target layer which remembering as W_0 , So the program D_k in the target level of the total order Should be: $D_I = W_I \cdot W_0$. Similarly to D2~D6. Then the best destination for the refugees can be identified.

2.4 Actual Test

Because there are great differences in the judgment matrix constructed by different refugees, this model can be applied to individual refugees. It will be more effective for the specific refugee to selecte for his best destination, of course, due to the consistency of the group, we can also choose the best destination for a specific group within a certain error range.

In order to verify the model feasibility, we work from an practical refugee, constructing the judgment matrix. After the consistency check, finally we get weight of six choices about program layer as shown in Tab. 2.

Tab. 2: Choice of a specific refugee

Destination	Germany	Sweden	France	Italy	Switzerland	UK
Weight	0.3139	0.2180	0.1362	0.1362	0.1028	0.0928
Route	1	2	3	4	5	6
Weight	0.18055	0.03309	0.05232	0.09028	0.32188	0.32188

After sorting, we can easily select his best migration route: travelling through Route 6 to reach Germany.

3. Conclusion

Our model is established to develop a set of effective refugee crisis measures to help the refugees to choose the best route to reach the destination. First, through accessing to information, we select nine factors affecting refugees safe migratory greatly. After the identification of these standards, we use hierarchical analysis method, and regard the selection of an object as the target layer, the impact of various standard as the criterion layer, the specific destination as the layer scheme. By the scheme of the target level of total ordering and then choose the best destination and route for refugees. Our model has been proved good robustness and flexibility.

References

- [1] <https://en.wikipedia.org/wiki/Refugee>
- [2] Thomas L.Saaty, Jennifer S.Shang, An innovative orders-of-magnitude approach to AHP-based mutli-criteria decision making, Prioritizing divergent intangible humane acts[J]. European Journal of Operational Research . (2011)

- [3] C. Michael Lanphier. ,“Refugee Resettlement: Models in Action,” *Center for Migration Studies of New York, Inc.* , vol.17, no.1, pp.4-33, Spring, 1983.
<http://www.jstor.org/stable/2545922>