The Typological Rule System of Malay Houses in Peninsula Malaysia

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Abstract
The Malay house is distinctive by its composition of several buildings clustered with respect to its main unit. This study attempts to explore the formation rules of this type and its variations from both a spatial and construction point of view. More than 200 houses in the nine states of Peninsula Malaysia are examined and divided into five groups for detailed analysis and comparison. All Malay houses under study can be produced by five sets of rules and their sub-rules, which act as a descriptive language as well as a generating mechanism. The rule system is organized in three layers that can account for the transformations of local styles in Peninsula Malaysia, which may reveal stimulating information regarding the evolutionary relations among Malay house types.

Keywords: Malay house; typological rule; rule system; Peninsula Malaysia

1. Introduction
Spatial form and construction language, that mutually support one another and interact in various ways, are considered two fundamental aspects of typological studies. Spatial form is deeply embedded in the culture while the construction language may travel from one culture to another. The change of spatial form, primarily resulting from changes in living conditions, may require the transformation of construction languages accordingly, which may reciprocally entail related changes in spatial form. It is hypothesized that each culture has its house genotypes from which many typological variations are derived (Wang, et al, 2002, 2003). The methodic goal of typological study is to formulate a rule system that can sufficiently account for all observed house types of the culture under study.

Among many built form cultures of Southeast Asia, the traditional houses in Peninsula Malaysia distinguish themselves by the following features: the stilts footing, non-boat image, small roof, light wood construction, as compared to the heavily built forms such as Batak Karo and Tongkonan houses in Indonesia (Waterson, 1990), and a compound of multiple built masses organized around the central main building as one family unit (Nasir & Teh, 1985). A kampung, i.e. village, is made up of many Malay houses, and each retains its style characteristics no matter whether it is in a rural area or a more urbanized location (Chen, 1998).

In terms of spatial organization and construction method, the main building of a Malay house can be considered the prototype for all of its associated buildings, and it is also the pivot from which various ways of expansion are developed into different house types in different areas. Conceivably, the main building is quite distinctive for having the largest volume and the highest roof. One or more smaller houses with descending roofs are attached to the rear of the main house. (Lim, 1987). Through the input of some foreign construction language, there are more diversified spatial and formal transformations.

There are two sources of data in this study. One is the KALAM Centre and the Department of Architecture at Universiti Teknologi Malaysia (UTM), whose architectural research, surveying and mapping have been collected for decades. The other is the field survey on Peninsula Malaysia conducted from 2005 to 2007 by the National Cheng Kung University group from Taiwan.

More than 200 house types...
cases are studied and classified into five groups: Group 1: Negeri Sembilan, Selangor, Melaka and Pahang, Group 2: Perak, Group 3: Kedah and Perlis, Group 4: Penang and Group 5: Johor. (Fig.1.) The first step of the investigation is to identify the house prototype, followed by observing the generating process of each house group in terms of spatial layout and construction. The third task is to formulate typological rules that can account for all the house cases in Peninsula Malaysia under study.

2. Prototype of the Malay House

*Rumah tiang enam* (six-column house), according to literature, is the earliest house form in Malaysia (Oliver, 1997). However, *rumah tiang dua delas* (twelve-column house) was derived from *rumah tiang enam* because the limited living space of the latter failed to meet the needs of daily living. *Rumah* (*House*) Datuk Baginda Tan Mas Mohar in Negeri Sembilan, built in 1850, can best serve to illustrate the prototype of the Malay House (Fig.2.-1, 2).

2.1 Spatial Layout

*Serambi*, *rumah ibu* and *dapur* are the three main spaces that form a quite rigid layout relationship. *Serambi* can be reached via the staircase from the exterior ground or from an entrance platform. *Serambi* functions as the reception area, dining room or bedroom for the guests, and the floor can be sat or slept on. *Rumah ibu*, as the core space of the house, refers to two things: the volume of the main house and the space inside to serve as living room in the daytime and bedroom at night. The furniture is few and simple, and different carpets on the floor are used for different needs. *Dapur* basically is the space for cooking and eating (Chen, 1998).

In the case of *serambi*, the width of the space is only about 1.7m compared to the norm of 2–3m. The reason for the small dimension lies in the custom that in Malay gatherings there are usually four guests sitting on the ground with one person walking around and serving the food. Therefore, the 1.7-meter width is sufficient (Ariffin, 2001). Male gatherings take place in *serambi*, female gatherings in *dapur*.  

2.2 Construction

The original *rumah tiang enam* (six-column house) contains three columns on each of the two sides. A flat-beam (*1*-level), with flat rectangular section, is placed on top of the three columns, and another 3 perpendicular flat-beams (*2*-level) are placed on the 3 pairs of columns on top of these two parallel flat-beams. The post is located in the middle of the three flat-beams, and the oblique beams are positioned at the ends of the post and the flat-beams to form the original roof. In case of the need for extension, one or two rows of columns parallel to the house ridge are added to extend one or two more spans. This is a technical way of building the encroachment. Such a main house forms the style of pitch roof with double-slope and is composed of one *rumah tiang enam* as well as two encroachments, which forms a *rumah tiang dua delas* (12-column house). (Fig.2.-1)

2.3 Form

The house ridge of the main house is usually parallel to the road and vertical to the entrance. The double-slope roof of the main house is approximately 5 meters high, some will reach to 9 meters. The floor of the core space is lifted from the ground by about 1.35 meters in general, and 3 meters as the exception. The floor of *serambi* is lower than that of the core space by about 10 centimeters. Since the double-slope roof has long been considered as the image of identity for Malaysian built forms (Fig.2.-3, 4), taking *rumah tiang dua delas* as the prototype of Malay houses is therefore quite reasonable.

![Diagram](image)

1: 12-column house with traditional construction. 2: Plan of Rumah Datuk Baginda Tan Mas Mohar. s = serambi (reception area), r.i. = rumah ibu (core space), d = dapur (kitchen and dining room). 3: Logos of Mini Malaysia Village, and Board of Architects Malaysia. 4: New building

Fig.2. Prototype of the Malay House

3. Analysis of House Type in Different Regions

3.1 Houses in the Negeri Sembilan, Selangor, Melaka, and Pahang areas

The prototype mentioned above can be considered as the starting point of typological development in this region (Fig.3.-1). The twelve-column house has been developed into the 3-span, 16-column house (Fig.3.-2); *bilik tidur* (bedroom) is further divided from *rumah ibu* (Fig.3.-3). In the course of such development, the depth of a single main house will not be increased, but the width may extend from 2 to 3 or even 4 more spans. Moreover, the width of *serambi* will be increased (Fig.3.-4), or anjung, a piece of front-extending space, will be added (Fig.3.-5).

A sub-house behind the main house is built and serves as *dapur*, and *rumah ibu* will be inserted in case there is more space available (Fig.3.-6–9). The main and sub-houses are usually connected eave to eave. More encroachments or sub-houses can be further added behind or beside the sub-house (Fig.3.-10–13).
The added sub-houses serve the function of both *bilik* and *rumah ibu*. Most house compounds in Negeri Sembilan are built in such a way that the wall lines of one side of the main house and the connected sub-houses are in alignment, which prevents the sub-house from extending beyond the main house (Fig.3.-6, 9, 10, 13). In Melaka state, however, the main house and sub-houses may connect to each other without such alignment restriction (Fig.3.-11,12).

The organization of interior spaces also exhibits remarkable differences. One enters a house in Negeri Sembilan from the main house entrance, then proceeds straight through the *serambi* and *rumah ibu* to reach its sub-houses. However, the second sub-house in the Melaka region is often placed in such a way that it is accessible only by making a turn in the first sub-house.

The traditional construction is adopted extensively in this area, which presents quite a clear image. The main houses may vary in width and height, as well as the scale of the *serambi*, whereas the depth seldom changes. There are rules for the main house construction, while the sub-house, usually built in rather a simple way, is less restricted. The *Serambi* may extend beyond the width of the main house on both sides, but its ridge is far lower than that of the main house. Cases in which the *serambi* detaches from the main building and becomes an independent house have not been found so far.

### 3.2 Houses in Perak

No isolated main house has been discovered in Perak. The earliest recorded case is *Rumah Itam Bahak*, built in 1819, whose main house is of 12 columns, 2 spans in width and 3 in depth. The sub-house behind the main house serves as a *dapur*, the *selang*, i.e. the corridor that connects the main and sub-houses is its main feature (Fig.4.-1). The main house of *Rumah Andak Endah*, built in 1920, is of 16 columns. An *anjung*, or front extending space, was built at the central part of the façade. The main and sub-houses are connected with a *pelantar* (platform) (Fig.4.-2). The "*selang*" and "*anjung*" in these two cases constitute the common futures of Perak houses.

All the main houses in this region are of 2 or 3 spans in width and depth. The smallest main house has a dimension of 2*2 spans (width*depth) (Fig.4.-3). *Anjungs* are mostly located in front of the middle span of the 3-span plan of the main house. A case as shown in Fig.4.-4, where the *anjung* occupies 2 spans width, is very rare.

Thanks to *selang* and *anjung*, there emerges such a special house grouping as: *anjung*+main house+*selang*+sub-house+*selang*, from which "zigzag" or "straight" circulation may have been
formed depending on whether the *selang* is connected from behind to the side or is at the center of the house (Fig. 4. - 5, 6 - 8). The majority of the houses in this region are in long shape and are positioned perpendicular to the road with a few that are parallel (Fig. 4. - 9, 10).

Cases as shown in Fig. 4. - 1, 2 are early houses in Perak state, which demonstrate the prototypical construction of the main houses and are different from those built recently which, without parallel flat beams, use the outer columns to support the surrounding beams and employ the post on the crossing beams to support the ridge. Between the surrounding beams and the ridge oblique rafters can be placed to build the hipped roof (Fig. 4. - 11). Such a method might be transplanted from elsewhere into the region. The traditional double-slope method has been replaced by the single gentle slope method that produces hipped roofs to offset gables, which yield to an integrated roof landscape without particularly emphasizing the main house.

**3.3 Houses in Kedah and Perlis**

The houses in Kedah and Perlis are characterized by integrating the main and the sub-houses into a "longitudinal building" with *dapur* separately located in the back or on the side.

The *Rumah Wa Jah* in Perlis, built in 1905 as the earliest house that has been documented, is composed of one main house and one sub-house (Fig. 5. - 1). The main house is 3-bay in width and 4-bay in depth. The first bay is a *serambi*. the inward 3 bays mainly serve as *rumah ibu* and *bilik*. The sub-house behind serves solely as a *dapur*. Two major features are noticed: 1) the longitudinal configuration; 2) the roof ridge is perpendicular to the entrance direction. More recent cases indicate the same features. The depth was expanded from 4 to 6 bays; the sub-house can be moved to the side (Fig. 5. - 2, 3). Some cases with 2-bay width and 6-bay depth are found as well (Fig. 5. - 4, 5, 6).

Two techniques for roof construction are found in the following cases: (1) The main house built by the traditional method has been located with a 90-degree angle to its original position, which causes the gable to face the road and the roof ridge to be parallel to the entrance direction (Fig. 5. - 7). (2) The mixed construction technique is adopted to form a multi-ridge and multi-roof form. Shorter construction members are chosen to form a more complex roof landscape and lower roof height (Fig. 5. - 8).

**3.4 Houses in Penang**

With its roof ridge parallel to the road, the main house is a typically traditional twelve-column house. The entrance at the side of the main house leads to the *serambi*, and a *ruang tangga* is formed by a transition platform and a staircase with a cover above.

The most special feature of the Penang house type is *rumah gajah menyusu* (lactation of elephant). The first sub-house is built on the gable side of the main house and attached to the gable directly. The *gajah menyusu* roof and floor are lower than those of the main house. The second sub-house is usually built behind the first and is often parallel to the ground (Fig. 6. - 1, 2, 3). It can also be built in the *gajah menyusu* way and attached to the gable of the first sub-house gable (Fig. 6. - 4). In addition to *gajah menyusu*, some sub-houses are built behind the main house and are connected eave to eave (Fig. 6. - 5, 6). The traditional construction is usually adopted so that the double-sloped gable roof image is emphasized.

**3.5 Houses in Johor**

The southern part of the peninsula is Johor state,
which faces Singapore across the Johore Strait. There are no cases of isolated main houses in Johor. The main houses here are mostly 3-bay in width and in depth. The sub-houses added behind the main houses are connected mostly with selang. The Anjung is arranged in the front and the ruang tangga is located on the side of the main house.

Mixed construction is usually adopted in this region, which makes the technique even better. This fact, therefore, affects the spatial layout and enhances the variety of the plan. The plans of Fig.7.-1 and Fig.7.-2 are rigid, whereas the case of Fig.7.-3 shows that the main house plan is no longer in rectangular form. As shown in Fig.7.-4, 5, the corner construction of main house even presents a non-orthogonal composition. While the main house is becoming more and more unconventional, the sub-house remains traditional.

By observing the variations of the three cases (Fig.7.-3, 4, 5), it appears that the expanded parts of the main house are its biliks (bedrooms). It seems logical to infer that the expansion of the bilik area here is more valued than that of the core space. Therefore, the volume of the core space remains the same while the biliks are expanded (the rectangle is thus transformed). The dimension of the prototype, rumah ibu and dapur, is width*depth=2*3. The ways of extension include: increasing or decreasing the depth, increasing or decreasing the width, increasing the stories.

### R2.2: Rule of main-house extension

Apart from the existing serambi, rumah ibu and dapur, the additional rumah ibu, bilik and rumah tengah are arranged linearly when the space is extended. Furthermore, the order of approaching from the outside is either first to the serambi (male gathering), then to rumah ibu; or from the outside first to dapur (female gathering), then to rumah ibu, in order to conform to the need of separate entrance of males and females in the case of meetings.

### R2.3: Rule of house grouping

Sub-houses are added and connected at the side of the main house, or at the back of the main house in two positions: either at the center or at the side. There are five ways of adding and connecting houses: 1) Eave to eave: 20~30 centimeters are left between the parallel eaves. A gutter is set under the eaves to drain rainwater out of the house and to make it an interior space. 2) Pelantar: The parallel eaves are separated and thus a roofless outdoor space similar to an inner court is created. 3) Selang: a long roof is placed on the space between two parallel eaves to create an interior or semi-exterior, corridor-like space. 4) Integrated: the main and sub-houses are integrated into one structure. 5) Encroached: the encroachments can be attached to the main house or sub-houses.

### R2.4: Rule of construction adoption

Traditional truss construction and the mixed truss construction are the two major methods that can be employed freely to fit the building situations.

### 4.2 The System of Typological Rules

In addition to the rules described above, the parameters and sub-parameters can develop more operations and can formulate more sub-rules, which are classified as the 3rd-level rules, including three elements. A rules system is often formulated with hierarchical organization. If rule $y$ is valid only with respect to rule $x$ which specifies the necessary conditions for rule $y$ to apply, then rule $x$ governs rule $y$; or rule $x$ is at a higher level, and rule $y$ is at a lower level (Habraken, 1982). Such hierarchical structure is quite normal to many rule systems and is no exception to the typological rules of Malay houses that are formulated as follows: R1, R2, R3 stand for the first-level, second-level, and third-level rules respectively. If there are three sub-rules under the second-level rule, they will be identified as R2.1, R2.2, and R2.3, and so on.

#### R1: Rule of spatial hierarchy

The serambi, rumah ibu and dapur in the indoor space are arranged in front-to-back order.

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spatial layout rules (R3.1.1–3), five ways of main-house extension (R3.2.1–5), five ways of main house and sub-house connection (R3.3.1–5), and five truss variations (R3.4.1–5). Table 1 illustrates the 3rd-level rules compared with the 1st- and 2nd-level rules.

5. Discussions on Evolution of Malay House Types

5.1 Evolution: From Main House to Compound House

A valuable corps of empirical data regarding typological evolution can be found in the central area of Peninsula Malaysia, which can be demonstrated by the existing cases in Negeri Sembilan. *Rumah tiang enam*, the six-column house, (Fig.8.-1) was the primitive Malay house, which can be developed by adding two encroachments to form a *rumah tiang dua delas* (twelve-column house), the prototype of the Malay house. The existing *Rumah Datuk Baginda Tan Mas Mohar* (Fig.8.-2), with two spans in width and three spans in depth, is one example of the *rumah tiang dua delas*. With the traditional technique of constructing the roof frame, the width of the *rumah tiang dua delas* can easily be extended into 3, 4, 5, or more spans, i.e. a 16, 20, 24, or more-column house. *Rumah Dato Seri Maharaja* (Fig.8.-3) shows the 16-column house case as a single main house for one family. The main house may be extended in different ways, of which a popular one is the "serambi extension", shown as the case *Rumah Haji Darun Bin Ibrahim* (Fig.8.-4). *Rumah Hajah Selipah* (Fig.8.-5) presents the case of a main house with a *serambi* extension and a sub-house added at the back. While *Rumah Bumbung Panjang* (Fig.8.-6, 7) is the case of a main house with two sub-houses at the back and a *ruang tangga* attached to the main entrance.

The existing cases shown in Fig.8. indicate one evolutionary process of the Malay house, from a primitive house to a Malay house of more complexity. The house evolution emerges usually in two stages: one is the extension of the main house, and the other is the formation of the house compound. However, the extension of the main house is usually limited to the 16-column house (three-span in width), with few cases of 20-column houses (four-span in width), whereas the later houses are enlarged by increasing the sub-houses in the back of the main house. This transformation, from main house to compound house, became the turning point of Malay House evolution.

5.2 Variations Provoked by Construction

Traditional construction contributes to the distinctive

| 1st-level Rule | Parameters | 2nd-level Rule | Parameters | 3rd-level Rule |
|----------------|------------|----------------|------------|----------------|
| R1: Rule of Spatial hierarchy (S. R.I.D. are in front-to-back order) | Serambi, rumah ibu, serambi | R2.1: Rule of spatial layout (RI and bilik are placed linearly between S and D) (Spatial layout: O→S→R.I for male; O→D→RI for female) | Serambi, rumah ibu, serambi, bilik, ... | R3.1.1 (Spatial groups are arranged linearly) |
| | | R2.2: Rule of main-house extension (Extended from the prototype with dimension of width*depth=2*3 spans) | Width span Depth span Anjung Serambi Ruang tangga | R3.1.2 (Spatial groups are arranged firstly in alignment later with corners) |
| | | | | R3.1.3 (Spatial groups are arranged width ways) |
| | | R2.3: Rule of house grouping (Back or side extension and connection) | ‘Eave to eave’ ‘Pelantar’ ‘Selang’ ‘Integrated’ ‘Encroached’ | At central back At side of back At side | R3.3.1 (Back connection, sub-houses in alignment with the side of the main house) |
| | | | | R3.3.2 (Back connection, sub-houses exceeding the side lines of the main house) |
| | | | | R3.3.3 (Back connection, central bays in alignment) |
| | | | | R3.3.4 (Central bays in alignment, sub-houses integrated) |
| | | | | R3.3.5 (Side extension of the main house) |
| | R2.4: Rule of construction (Adopt two optional constructions freely) | Traditional construction Mixed construction | | R3.4.1 (Traditional construction, oblique truss) |
| | | | | R3.4.2 (Traditional construction, bullhorn ridge) |
| | | | | R3.4.3 (Mixed construction, main and sub-houses integrated) |
| | | | | R3.4.4 (Two constructions, turning angle 90°) |
| | | | | R3.4.5 (Mixed and small truss) |

Table 1. System of Typological Rules
image of the main house. Interior spaces usually flow freely under the roofs of the main and sub-houses, which unfortunately bring gutters inside the house, such as in the houses of Melaka and Negeri Sembilan (Fig. 9.-1, 2). Houses in Perak adopt the transplanted construction to integrate easily the *anjung*, main house, *selang*, and sub-house into a single unit (Fig. 9.-3).

Under the integrated roof, interior spaces may connect freely beyond the limits of separated house volumes as built by the traditional construction method. In addition, mixed construction provides the possibility of making one single big roof into a multi-roof composed of smaller trusses as presented by the house type in Kedah (Fig. 9.-4). Houses in Johor make a free-shape roof possible, as well as a more changeable interior spatial arrangement (Fig. 9.-5). Two kinds of construction trigger different evolutions of the roof and the house grouping, which connect to the transformations of spatial layout.

### 5.3 Formation of Local Style

The five cases that have diverse appearances in Table 2 are located in different parts of Peninsula Malaysia. The formation of the typological rules all follow the first- and second-level rules. The diversity of the third-level rules is greater, and thus the different combinations of the 3rd-level form the sub-types with different regional styles, which may be seen as similar to the dialects of one language. The formation of a house type is determined by the higher level rules, while the regional variations are the result of applying lower level rules.

To conclude, the creation of new typological...
instances can be made according to two principles: 1) maintaining the parameter values but increasing the intensity of the rule operations. 2) Changing only the 3rd-level rule combinations, which can enjoy greater diversity of outlook.

6. Conclusion
Despite the seeming diversity, house types in Peninsula Malaysia share a common typological rule system. This study begins with clarification of the Malay house prototype in terms of space, construction, and form. In the analysis, the first level typological rule is shown as R1. As spaces increase, the prototype will extend itself to the limit and add sub-houses behind the main house, instead of straightforwardly expanding itself to a larger scale. Different types of construction were adopted and used together with traditional construction methods. Their operations can be verified by the second level typological rules, R2.1–R2.4.

Among the five groups of Malay house as categorized in this study, only the house types in the central region, including the prototype, larger single main houses, and cases in which the main house was constructed with various extensions and sub-houses, may be concluded to a complete evolution process. As yet, the other four groups do not present traces of their evolution. However, numerous variations have been found in the Peninsula, and have demonstrated plenty of local styles in terms of the third level typological rules, R3.1.1–R3.4.5.

Rule systems that developed from the 1st, 2nd, to 3rd-level present the formation process from simple to complex. As a rule system extends to the next level, new concepts and new parameters will be employed to produce a great amount of variations, which may reveal the evolutionary traces of a house type. A rule system may become more detailed so that it is possible to go into the 4th or 5th-level rule, if materials, ornamentation, or interior design, etc. are taken into consideration. A detailed rule system exhibits a sounder knowledge of house type.

It is also important to know that the rule system is a generating mechanism. Parameters of each rule are stabilized and fixed, but the values and performances of each parameter are quite flexible. A rule system in its operational sense implies "flexibility under limit". It requires more discussions concerning the interactions of "limit" and "flexibility" in order to understand the generative mechanism innate in the house type that makes evolution possible.

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Notes
4 Forty cases, selected from the two sources of data, were presented in this paper. Cases from the original findings of this study are 16 cases, including Fig.4.-3, 4, 5, 9, 10, Fig.5.-4, 5, 6, Fig.6.-1–6 and Fig.7.-4, 5. Cases originated from the KALAM Centre, Department of Architecture at UTM, are 24 cases, including Fig.3.-1–13, Fig.4.-1, 2, 6, 7, 8, Fig.5.-1, 2, 3 and Fig.7.-1, 2, 3.
5 All figures were redrawn or 3D-remodeled by the authors.
1 KALAM Centre is the abbreviation of "Pusat Kajian Alam Bina Dunia Melayu" in Malay, (Centre for the Study of Built Environment in the Malay World), founded in 1996.
2 The Department of Architecture at UTM has undertaken the "Measured drawing programme" since 1976, and has collected more than 350 cases, including traditional houses, palaces, mosques, colonial public buildings, commercial buildings, and institutes.
3 The first field survey on January 2005 visited Melaka, Negeri Sembilan, Selangor, Johor, and Terengganu. The second, in August 2005, visited Johor, Penang, Kedah, Perlis and Perak. The third, in August 2006, visited Melaka and Kuala Lumpur. The fourth, in November 2007, visited Kelantan.
4 The line between the genders is extremely clear in the Muslim religion. The opposite sex is divided into "related" and "unrelated" groups. Visits among friends and family are considered important in Muslim society. During such visits, seeing the unrelated opposite-sex of the host family is strictly avoided. Even gatherings of men and women within one family are separated. (Mazumdar and Mazumdar, 2001) The arrangement of the separating wall between serambi and rumah ibu in Malay houses is thus natural and understandable.
5 House plans show the positions of doors, but windows are not included. The main house and sub-house are represented in grey hatch; anjung, serambi, ruang tangga, and other encroachments are white.
6 Based on Christian Pelras's statement (Oliver, 1997), Sulawesi was one of the possible places from where the Bugis brought the construction technique to Peninsula Malaysia. Java may be the other place, from where the Javanese immigrated to Malaysia with their construction technique. For instance, Rumah Limas, the name of house containing this kind of construction, was adopted similarly in Malaysia and Java, Indonesia (Funo, 2005).

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