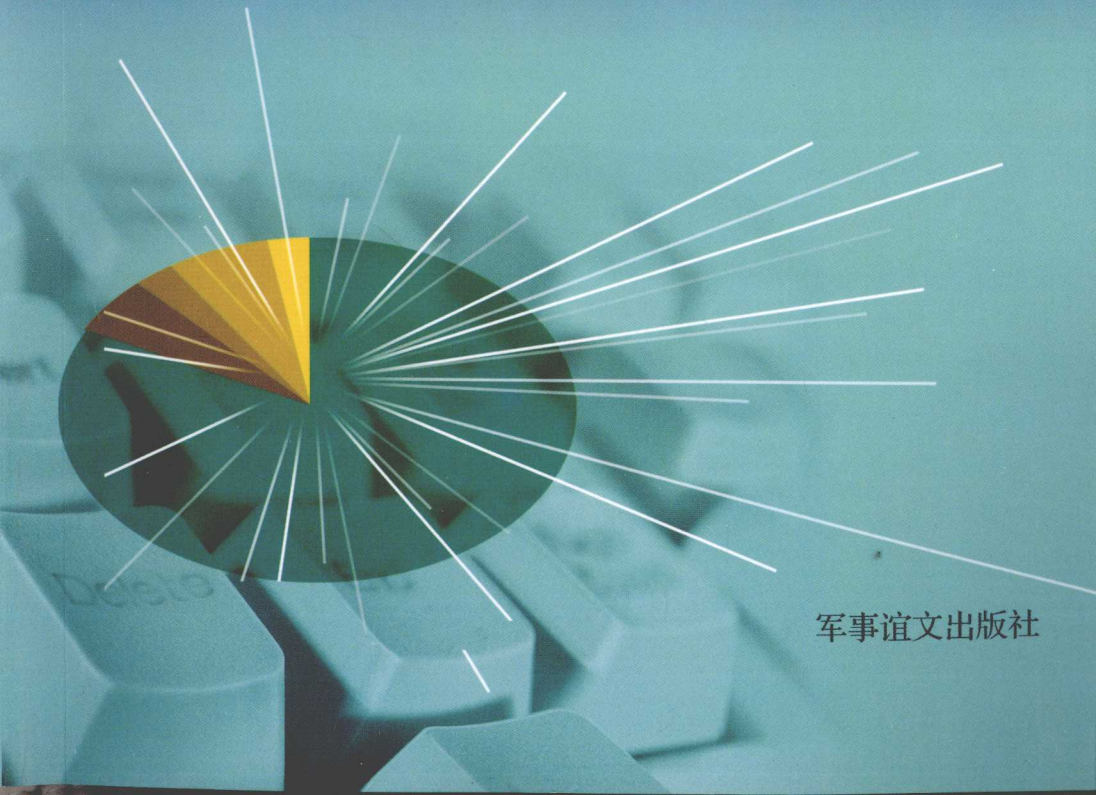
计算文体学

工作模式探究

孙爱珍 著



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前　言

本部著作主要目的在于提出并证明计算文体学的工作模式，还不属于整个计算文体学的学科建设的最终建立，但期望通过对其计算模式的证明揭示计算文体学的学科地位应该得到承认。计算文体学已有很多成功的计算案例，但至今没有建立起独立的学科地位。

本部著作以计算案例为基础，提出一种通用的工作模式，并且为了证明此模式的可行性，以曼斯菲尔德作品中的情感计算为个案研究实例。计算方法吸收了计算语言学、语料库语言学、统计学的因素。

计算文体学被认为是计算语言学的一个分支，尚无独立的学科地位。但是本项研究经过对大量文体计算案例的分析，发现计算文体学在研究对象和研究目的上已经超越了传统上对它的认定，而且有着自己的计算模式，所以我们认为，计算文体学应该从计算语言学中独立出来。在学科建设方面，我们认为，计算文体学在研究对象和研究目的方面与现代文体学保持一致，在工作模式上借助计算语言学、语料库语言学和统计学的工具，已形成了独特的系统。

计算文体学的研究对象不再是边缘语言现象，它已经深入到语言的各个层面，可以完全按照现代文体学的定义进行语言现象的计算；其研究目的也不再专项服务于机器自动处理即人工智能的实现，而是把计算得到的数据与主题意义的分析联系起来。

为了检验计算文体学的工作模式，本项研究以曼斯菲尔德作品中的情感流动为研究对象，尝试利用计算文体学工作模式，实

现对情感的计算，从而验证所提出的计算文体学模式的可行性。

情感流动在文学批评和文体分析研究中并不是新生事物。情感（affect）、感情（emotion）、态度（attitude）被认为是同义词，都用于文本主体和美学意义的阐释。但是情感流动尚未被认作一种语法结构，更谈不上探究。然而，正如列文－施特劳斯把结构主义方法运用于神话的分析，甚至创出术语“神话素”，他的学生后来努力构建“神话语法”，本篇论文试图揭示文学语篇中情感流动的结构构成。

情感的计算是个艰难的探索过程，主要是因为情感被认为是纯主观的认识和反应，对其进行计算——客观的数据本身就很难让人产生共鸣，应用于文学语篇中的情感计算更是难以被人接受。但是本项研究者认为情感在语篇中表现于客观的语言层面上，就一定有客观基础，对这些客观的语言现象的确认就可保证情感计算的可行性。

本项研究受评价系统的启发，提出语篇的情感主要由情感词汇所决定，情感流动主要由情感词汇在语篇中的分布所形成。由此我们探寻：文学语篇的情感流动是如何形成的，是否与情感词汇有重要关联？

经过对汉语词汇学中褒贬义词的研究、文体学界对情感流动的研究、语料库语言学对搭配中形成的语义韵的研究，尤其是评价系统中的有关语篇态度研究的学习，本项研究逐渐形成了关于文学语篇情感流动形成机制的假设，并明确提出这一理论假设，即：情感词汇在语篇中形成自己的域，并对域中的中性词汇产生辐射；情感词汇携裹域中的辅助手段（级差手段），形成大小不一的域，波动向前，由此形成语篇中的情感流动；相连的同样色彩的情感词汇结合成链，形成更大的情感域；情感域的域界标志为两个相连的同样色彩的情感词汇。

基于此项理论假设，本项研究析离出一些因子（factor）：情感词汇、域界标志、级差手段，并提出进一步假设：利用这些因

子可以进行语篇情感的计算。

接下来的研究就是对这些因子的进一步探寻。情感词汇可以划分为积极情感词汇、消极情感词汇和中性情感词汇。其中，中性情感词汇中有些特别活跃，极容易被染上与其搭配的情感词汇的色彩，与积极情感词汇搭配，就呈现积极色彩，与消极情感词汇搭配，就呈现消极色彩，但有时保持中性，没有色彩。这些词汇在本项研究中，被命名为中性易感词汇，在文本中，根据语境中表现出的感情色彩，被称为中性积极词汇或中性消极词汇。很多词汇具有双重身份，对计算的准确度造成干扰，只能在人工修改阶段进行修订；另外有些词汇单独不可明确确定其情感色彩，只能以句子为单位才可确定，也只能在人工修改阶段进行修订。

级差手段繁多，在目前技术条件下，尚无法完全纳入计算；再者由于级差手段是情感流动的辅助手段，只是对情感强度产生影响，不影响语篇情感基调，所以本项研究决定把级差手段留待以后的研究。这样，本项研究中的情感计算就是对语篇基本情感流动或语篇情感基调的计算。

整个计算过程本着从词汇到语篇的原则进行设计，经历情感词汇的判断和收集——形成情感词汇库——绘制语篇中情感流动模式图几个阶段。中间设计了两项测试：检测本项研究者对情感词汇的个人判断与同类读者的判断有多少差异，即是否具有一定的代表性；检测情感词汇库在实际应用中的准确度。

第一章绪论，主要介绍本项研究的形成原因和操作过程，同时提出了研究的目的和范围。根据语料库语言学和统计学的理论，对参与研究的语料范围和容量进行了定义和限制。

第二章文献综述一，介绍计算文体学的发展过程。展现计算机软件从对生语料到熟语料处理的发展进程，反映人们在运用计算机技术进行文体分析方面对技术不断提出的要求，从单纯地依赖技术进行文体标记统计上升到将人的定性分析和认识符号化，对生语料进行人工加标，从而提高方法的精确度和理论性。最后

提出计算文体学的模式，并且提出情感流动研究中的计算模式，证明计算文体学模式的可行性。

第三章文献综述二，主要介绍有关情感流动的语言学研究。本项研究对于文体分析的意义是增加新的分析角度，而且采取语料库和计算语言学的方法。语料库语言学对语义韵的研究，表明情感词汇对与其搭配的中性词汇有情感辐射功能。系统功能语言学对人际意义的研究，特别是评价系统指出了情感词汇的中心作用，提出了语义韵域、级差手段、域界等概念，但其研究主要在新闻文体进行，而且其中的一些概念定义，例如对于域界的划分，解释不清楚。本章为情感流动结构理论假设的提出奠定了基础。

第四章是对情感流动结构理论假设的详细阐述。对提出的文学语篇中的情感流动结构所牵涉的几个因素，如中性易感词汇，语义韵域及域界标记、级差手段等等，进行更深一步的研究。

第五章主要是对情感词汇的研究。主要讨论情感和情感词汇的划分标准以及本项研究对情感词汇的收集方法。根据心理学、汉语词汇学、评价系统的研究，把情感划分为积极和消极情感，情感词汇划分为积极情感词汇、消极情感词汇、中性易感词汇（包括中性积极词汇和中性消极词汇）。确认的标准为：凡是表示褒扬、喜爱、尊敬的态度词汇和能给人带来幸福、安全和满足感的情绪词汇，为积极情感词汇；表示贬斥、憎恶、鄙视的态度词汇和给人带来不幸福、不安全和非满足情感的情绪词汇，为消极词汇。确认的依据是词典释义。收集过程分为三个阶段：（1）根据词典解释，对曼斯菲尔德作品中的词汇逐个进行判断，确认和挑选出情感词汇；（2）机器加标，对文本进行情感词汇辨识和加标，根据文本语境，对不合适的加标词汇进行人工修补；（3）最终收集文本中的标注词汇，得到曼氏情感词汇库。

第六章是实验研究，对读者主观性与情感词汇确认之间的相关性进行分析。为了检验研究者的研究是否具有代表性，选定一

些与研究者同类的读者阅读同样的小说文本，然后，对各位读者在阅读过程中确认标注的情感词汇进行对比，结果这些读者标注的差异并不是很大，表明研究者的判断和收集具有代表性。

第七章描述情感流动曲线图的绘制过程。在确认情感词汇的基础上，考察情感词汇在语篇层面上所表现出来的情感流动状态。通过对两个实例的分析，绘制出情感流动模式图；按照研究的思路，设计出软件，自动统计和计算文本中的情感词汇，而后给出所有样本文本的情感流动模式图和相关数据。

第八章研究情感词汇分布对语篇情感的预测。根据情感流动模式图，对曼氏的42篇小说进行分类，结果表明这些模式图可以在一定程度上揭示主题意义和辅助主题意义的分析和表达，也证明情感的计算在一定程度上有助于主题意义的阐释。另外，根据情感词汇的分布数值，对语篇情感进行分类，设定数值标准，可用以预测曼氏小说的情感类别。

第九章属于实验研究，检验所得到的曼氏情感词汇库在实际运用中的准确度。采用曼氏另外两部小说集中任选的小说，以及Irving和Lawrence作品中的小说片断作为语料。经过机器加标和人工修改，对判断的情感词汇进行统计。检验模式采用的是方差检验和T检验，结果表明曼氏情感词汇库在曼氏作品中有着极高的准确度；在不同作家的作品中存在误差，但是不显著，而不同的文体之间的情感辨识误差最大。这说明不同作家对情感词汇使用存在着一致性，这些一致的认识和词汇使用也许可以证明文学情感词汇库的设想在一定程度上是可行的，同时也表明这种方法的延展性：通过对大量文本的人工加标，建立通用情感词汇库，对某一领域的文本进行情感流动辨识也许值得一试。

第十章结语。本章节总结了在整个计算过程中所取得的曼斯菲尔德的文体特点和计算文体学工作模式提出并被证明的意义，讨论了本项研究所取得的成绩，并且指出了其中尚存的问题和下一步的研究计划。

如果说本文对相关研究有所贡献的话，应该表现在以下几个方面。

明确提出了计算文体学的独立学科地位。目前，国内的研究局限在语料库语言学对文体形式特征的提取方面，对计算文体学的定义和学科地位尚无明确定论；而国外研究也属个案论证阶段，也未给予计算文体学以独立学科地位。本项研究在大量文体计算个案的基础上，提出了计算文体学的定义和工作模式，理论上接受文体学的指导，工作模式方面吸收计算语言学、语料库语言学、统计学的因素。

为了证明计算文体学工作模式的可行性，本项研究以情感计算为案例，依据计算文体学的工作模式，提出了情感计算的模式。在计算过程中，明确了情感词汇的定义、分类、加标和收集的方法，并且设计了软件对情感词汇的分布进行描述，形成了情感流动模式图，从而为文体分析增加新的分析角度——情感词汇以及其在语篇层面上的分布所反映出的文体特征，并且在实际计算过程中发现了作者的“写作指纹”和文本的“情感指纹”。

在计算过程中，引入了统计学的方法，从实验设计到数据收集、统计建模、数据分析，对相关假设进行了检验，认识到，概率论的思想和方法对主观推断的证明有着毋庸置疑的作用。

关键词：计算文体学工作模式，情感计算，统计建模，方差检验

Foreword

This book works to propose and testify a working model for Computational Stylistics, not to construct the whole discipline completely, but expecting to reveal that it is the time to recognize the discipline status of Computational Stylistics at present through operation of the proposed model. Computational Stylistics has not been given an academic position as a discipline, although it has brought out many successful style – computation case studies.

Based on these case studies, this book tries to draw out a general working model. Furthermore, to testify the operationality of this model, the paper takes Katherine Mansfield's short stories for a specific case study: computation of affect flow through texts. The study adopts the methodologies of Computational Linguistics, Corpus Linguistics and Statistics.

Computational Stylistics has been considered a branch of Computational Linguistics, and still has not had its independent discipline status. But this research goes through massive literary style computation case studies, and discovers that the Computational Stylistic studies have already surmounted the traditional definition of Computational Stylistics formerly recognized, and has already had its own computation model; therefore we hold that Computational Stylistics should win its independence from Computational Linguistics. For discipline construction, in terms of the object of study and goal, Computational Stylistics maintains consistence with the modern Stylistics, and in working pattern, it has the aid of Computational Linguistics, Corpus Lin-

guistics and Statistics, and has formed a unique system of its own.

The object of Computational Stylistic study is no longer marginal linguistic phenomena, but those at all levels of language; that is, it can work completely in accordance with the definition of Modern Stylistics to carry on language phenomenon computation. Its research goal is no longer to merely render special service in machine automatic reduction, namely Artificial Intelligence's realization, but to calculate the significance of the theme of text, with data collected during the operation process of computation.

To examine the Computational Stylistics working model, this research takes affect flow in Mansfield's works as the object of study. The research uses the working pattern of computation to realize emotion computation, thus confirming the feasibility of the working pattern proposed.

Emotion flow is not something new in the field of literary criticism and stylistic analysis. Affect, emotion, attitude are generally considered as synonyms and used for the interpretation of the theme and aesthetic effect of the text. But up till now, affect flow has not been regarded as a kind of grammatical structure, let alone being explored. Yet, just as Lvi – Strauss takes structuralism into the analysis of myths and even takes the term of 'mytheme', and his pupils take an effort to construct the grammar of myth, this paper tries to touch upon the structure of affect flow in literary texts.

Affective computing is a difficult process of exploration, mainly because emotion is considered purely subjective awareness and response, and its computation—the objective data indicating emotion is very difficult to find echo in the heart of the reader, and when applied to the literary text, affect computing is more difficult to be accepted. But this study holds that since emotion is shown in its performance of

objective discourse at the language level, certainly it has its objective foundation. To affirm these objective language phenomena will guarantee the feasibility of affective computing.

Inspired by the Appraisal System, this study proposes that a text emotion is mainly decided by the emotion lexis, and the affect flow mainly formed by the emotion lexis distribution in the text, thus we want to explore: How is the literature emotion flow formed, whether it has much connection with the emotion lexis?

Based on studies on Chinese commendatory and derogatory terms, on flow of emotion in the field of Stylistics, on semantic prosody by Corpus Linguistics, esp. on relevant studies concerning the attitude of text by Appraisal System, this research has gradually formed the hypothesis upon the mechanism of the literary language emotion flow, namely: The affect lexicon forms its own domain in discourse, and produces radiation to the neutral lexis within the domain. The emotion lexicon takes along in one's own domain the grading methods (graduation system, by Appraisal System), forms the domain of which the size varies, which fluctuates forward like waves, resulting in the emotional flow of discourse. The continuous emotion words of similar appeal combine to form the chain, the bigger emotional domain. The stop marker of the emotion domain is two adjacent emotion lexis with similar appeal.

Based on this assumption, this research separates out some factors: affect lexis, stop marker of domain, the graduation system, and proposes a further hypothesis from this: we can conduct a discourse emotion computation by using these factors.

It is discovered in this research that the emotion lexis may be divided into the positive lexis, the negative lexis and the neutral lexis. In neutral lexis some are especially active, and are easily infected with

the appeal of emotional lexis. Matched with positive lexis, these active neutral words present the positive appeal, and matched with negative lexis, they present the negative appeal, but they sometimes maintain their neutrality, and present no appeal. These words in this research are named as the Neutral Sensitive Lexis. In the text, lexis with the sentimental appeal is called the neutral positive lexis or the neutral negative vocabulary. When collecting the neutral sensitive lexis, we discover that many words have a dual identity, which poses disturbance to the computation accuracy, and can only be revised at the manual work stage. Moreover some words may not explicitly determine alone their local emotional color, which can only be determined with the sentence as the unit. Such language phenomenon is unable at present to undergo machine's automatic identification, which can only be amended in the manual work phase.

The various grading methods, under present technological conditions, we find, can not be subjected to the computing completely. The graduation is a supplementary means to emotion flow which only influences the emotion intensity, and which does not affect the emotion main key, so we have decided to leave the grading method for later study. Thus, in this research affect computation is a computation of the basic emotion flow or the emotion main key.

The entire computational process is designed in line with the principle of from lexis to text, experiencing the stages of judgment and collection of affective lexis——the affective lexis corpus building - affect flow schema chart drawing. Meanwhile we have designed two tests: one of which tests what differences there are between the researcher's individual judgment and similar readers'judgments, namely whether the researcher's judgment is representative among the reader community she stands in; and one of which tests the accuracy of emotion lexis corpus in

its practical application.

The first chapter is an introduction of the thesis. It introduces the reasons and operating processes of this research, the research goal and scope. Based on Corpus Linguistics and Statistics, it defines and limits the scope and capacity of the corpus taken in the study.

The second chapter is the literature review (1). It introduces the development of Computational Stylistics, unfolding the computer software's processing from raw data to tagged data, revealing that the human being's unceasing demand for computer technology in carrying on stylistic analysis, from sole reliance on the statistical techniques for the literary style marker tagging to symbolization of human qualitative analysis and recognition for the annotation of raw data, thereby improving the precision of computation and its theory. Finally it brings out aworking model for Computational Stylistics, and proposes the emotion flow computation model to testify the feasibility of Computational Stylistics model.

The third chapter is the literature review (2). It talks about emotion flow – related linguistics research. First it points out that in the field of Stylistics, literary style study has not conducted an exhaustive research and given an explicit definition to emotion flow. This research's significance regarding the stylistic analysis is: it adds a new angle to stylistic analysis, and adopts the Corpus, Computational Linguistics and Statistics method. The Corpus Linguistics'research into the semantic prosody indicates that the emotion lexicon has an emotion radiation function upon its collocated neutral lexis. Systemic Functional Grammar studies the Interpersonal function of language, and the Appraisal System notes the emotion lexis'central function, proposes definitions concerning the domain of prosody, graduation system, stop marker of domain, but its research mainly carries on the style of news reporting; moreover some definitions of, for example, the domain stop marker,

is not explained clear. This chapter has laid the foundation for the theoretical assumption of Affect Flow Structure theory.

The fourth chapter is an elaboration on the hypothesis of Affect Flow Structure theory. Several factors which the hypothesis involves, like the neutral sensitive lexis, domain of prosody and stop marker of domain, graduation system and so on, are further studied.

The fifth chapter is mainly the emotion lexis research. Discussions are centered upon classification of emotion, classification criterion of emotion lexis as well as emotion lexis collection method conducted in this study. According to Psychology, Chinese lexics, Appraisal System's research, the emotion is divided into positive and negative emotion, the emotion lexis into positive lexis, negative lexis, neutral sensitive lexis (including neutral positive lexis and neutral negative lexis). The confirmation standard is: all expressions that show recommendations, affection, respect and those which bring happiness, security and satisfaction, can be regarded as positive lexis. Those expressions that show detests, dislikes, despises and those which bring unhappiness, insecurity and dissatisfaction, are negative lexis. The confirmation basis is the dictionary meaning. The gathering process is divided into three phases. (1) According to dictionary explanation, judge lexis in Mansfield work one by one, identify and select the emotion lexis. (2) Let computer carry on the emotion lexis identification in texts, tag relevant words, and then give manual repair——according to the context, patch out inappropriate tags. (3) Collect finally the annotated lexis, and obtain Mansfield's emotion lexis corpus.

The sixth chapter is an experimental study. It carries on analysis upon the relevance between the reader's subjectivity and the emotion lexis confirmation. In order to examine whether the researcher's confirmation is representative, it is designed that three similar readers read

the same texts with the researcher. Then, the study contrasts the confirmed emotion lexis tagged by fellow readers in the reading process. The result shows that these readers' difference is not very great, which indicates that the researcher's confirmation is representative.

Chapter7 mainly describes drawing process of the emotional flow curve. Based on the emotion lexis confirmation, the study inspects the lexis in the emotion flow displayed at the discourse level. Through analysis of two examples, this study draws up the emotion flow schema chart. According to this research pattern, the computer software is designed to automatically take up the statistical work and computation of the text's emotion lexis and draw up the corresponding emotion flow schema chart.

The eighth chapter studies emotion lexis distribution to forecast the text attitude. Based on affect flow schema charts, the study carries on the classification to the Mansfield's 42 novels, which shows that these schema charts can reveal the significance of the text theme and support the analysis and disclosure of the text theme, and proves that the emotion computation is helpful to the explanation of theme to a certain extent. Further, in accordance with the distribution value of the emotion lexis, the classification of a text emotion can be conducted and numerical standards set can be used to predict the Mansfield's fiction emotion category.

The ninth chapter is an experimental study, examining the accuracy of Mansfield emotion lexis corpus in the actual utilization obtained. Materials used here are the random – selected novels in Mansfield's other two books, and Irving's and Lawrence's novel fragments. After machine automatic annotation of the data and manual modification, the study carries on statistics of the selected emotion lexis. The ANOVA and T – test indicate that the Mansfield emotion lexis corpus

has the extremely high accuracy in her own works, and it has some errors in other two writers' works, which is not remarkable. This shows that there is some uniformity in different writers' use of emotion lexis. Perhaps the unanimous understanding and the lexis use may prove that the tentative plan to construct a literature emotion lexis corpus is to a certain extent applicable. Meanwhile the scalability of this method is proved proper: it may be worth a try to identify a text's emotion automatically, after annotating massive texts and building up a general emotion lexis corpus.

Chapter10 is the conclusion on the research. It concludes the stylistic features of Mansfield's, based on the working model proposed and meanwhile states the constructive implecation of this model. And it summaries the achievements made by the study, and points out the remaining issues and further research projects.

If this article has contributed to related research, it is shown in the following aspects:

It has proposed the discipline status of Computational Stylistics explicitly. At present domestic researches limit studies in the literary style form extraction done by Corpus Linguistics, and there is no explicit conclusion on the discipline definition and academic status of Computational Stylistics. Overseas researches regarding this are on a case verification stage, and have not given Computational Stylistics an independent discipline status. This research, on the basis of massive case studies of style, has put forward the discipline definition and its working model, and points out that Computational Stylistics accepts Stylistics theoretical guidance, and for the working model, absorbs factors from Computational Linguistics, Corpus Linguistics and Statistics.

To testify the feasibility of Computational Stylistics working model, this thesis takes emotion computation as a case study. Based on the work-